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A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE

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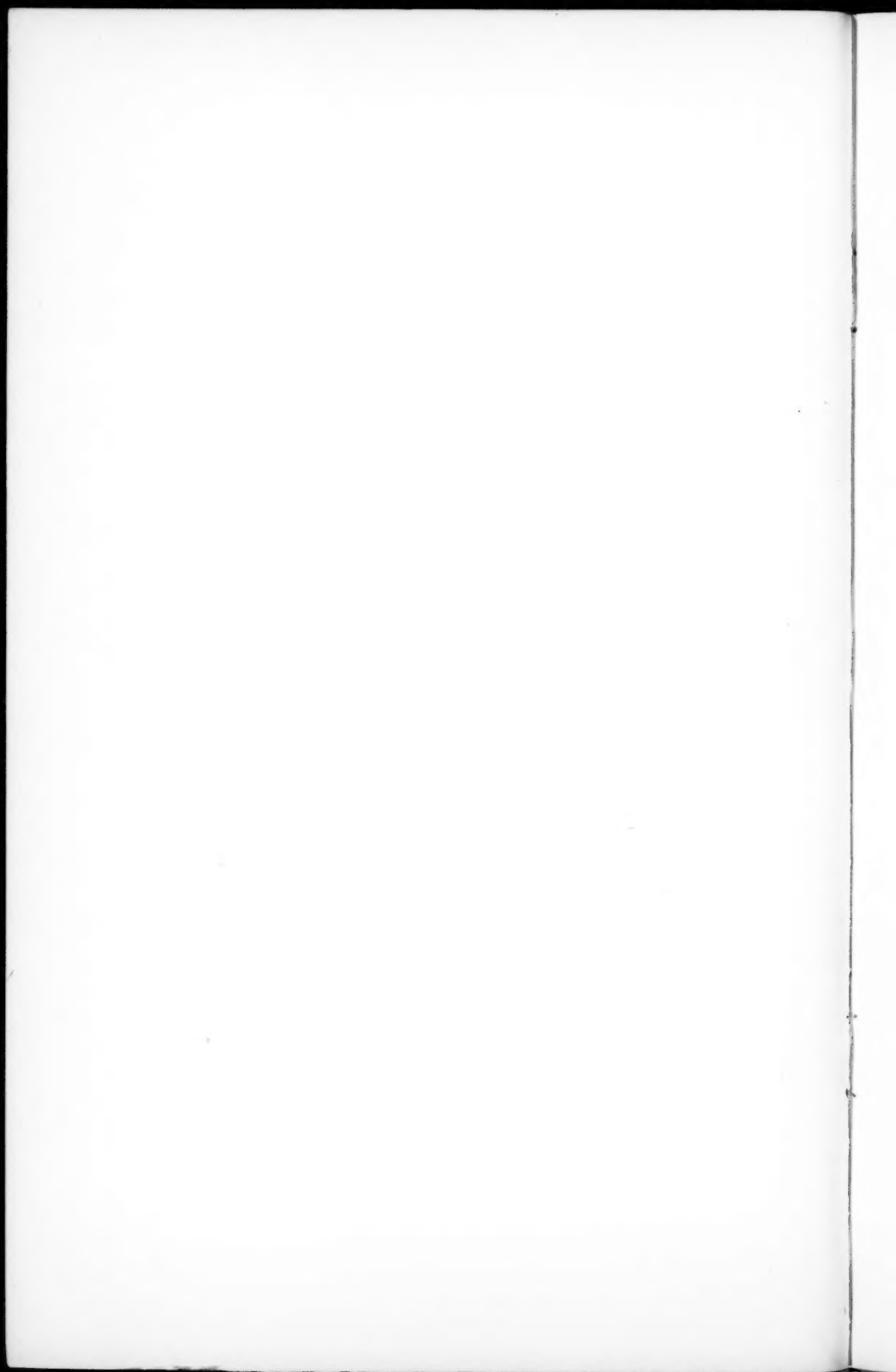
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# ANNALS OF SURGERY.

## SEPARATION OF THE LOWER FEMORAL EPIPHYSIS.

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IT is customary to look on fractures or separation of epiphyses as equivalent to fractures near a joint, from which, in many cases, they are almost indistinguishable, and to treat them as such. In some situations this may be quite correct from a practical point of view, but in separation of the lower epiphysis of the femur with displacement, such a view would be disastrous in the extreme, and one cannot help being surprised that surgical authors, as shown by the text-books, do not lay more stress on the subject.

Let me give illustrations from one of the most recent works on fractures and dislocations, and from one of the most recent text-books on surgery :

“ This (separation of the lower epiphysis of the femur) is not a very uncommon accident, occurring in young persons under the age of nineteen or twenty. In some of these cases there is an ordinary separation of the epiphysis, the fracture passing more or less entirely through the line of junction of the epiphysial cartilage ; in others there is a mixture of fracture with disjunction of the epiphysis. In these injuries the symptoms are much the same as those of transverse fracture of the lower end of the femur, and the possibility of this lesion having taken place must be borne in mind in dealing with injuries of this part in young persons. The treatment consists in putting up the limb on a double inclined plane, in order to relax the muscles which act upon the fragments, and treating the case as an ordinary fracture.”

Again :

“Separation of the lower epiphysis of the femur is not an uncommon accident in children. The wide surfaces are seldom completely separated, and the nature of the injury is further obscured by effusion into the joint ; but it can usually be recognized by seizing the shaft of the femur in one hand and the knee in the other, when lateral movement will be recognized, accompanied by the soft crepitus characteristic of a separated epiphysis. The treatment consists simply in supporting the limb for a few days on a back splint, till the swelling has subsided, when a starched bandage or plaster-of-Paris splint may be applied. Union usually takes place by bone, and is followed by some shortening from interference with growth.”

Could anything be more unfortunate than for a surgeon to follow the advice here set forth in treating such an example as Case I, hereafter to be described ? So far as I can ascertain, this fault of omission pervades the standard works on surgery, and it is, therefore, unnecessary to quote further examples. Fortunately, however, for him who has the time to search the journals, there is ample information on the subject, as there have been at least sixty cases recorded in English, American, French and German journals. To confine my references solely to my distinguished predecessors or to my colleagues on the staff of the Leeds Infirmary, I find papers by Hey, in 1869 ; Wheelhouse, 1869 ; Atkinson, 1883 ; Wheelhouse, 1884, and McGill, 1884. In 1883 I myself published a paper in the *Liverpool Medico-Chirurgical Journal*, pointing out the importance of the accident, and illustrating my remarks by specimens in the Museum of the Leeds School of Medicine. Since that time I have had three cases under my care ; in two there was displacement of the epiphysis forward, as shown in Fig. 1 ; in the third the displacement was incomplete, as shown in Fig. 2. I have seen at least three other cases, and in them all the dislocation was forward. I have never seen the displacement shown in Fig. 4, taken from Mr. Hutchinson's Archives, except in fracture just above the epiphysis.

CASE I.—*Separation of Lower Femoral Epiphysis, with Displace-*



*ment Upon the Front of the Femur.* (Abstracted from notes furnished by Mr. E. H. Batchelor.)

John William M., aged fifteen, was admitted to the Leeds General Infirmary, December 11, 1891. On the morning of admission the patient was struck over the lower part of the left thigh by a metal roller six feet long and five inches in diameter, weighing several stone; he at once lost all use of the limb. On admission a few hours later there was very great swelling of the left knee, with

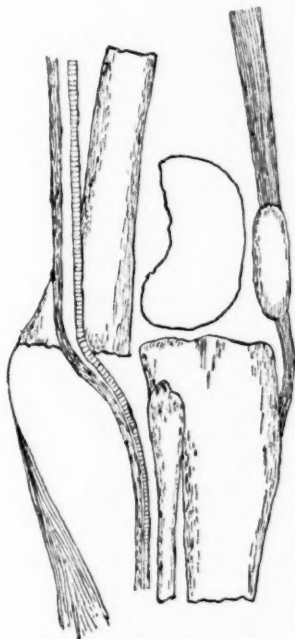


FIG. 1.—Complete forward displacement of lower femoral epiphysis.



FIG. 2.—Incomplete displacement of lower femoral epiphysis.

evident displacement forward of the lower extremity of the femur, and projecting backward into the popliteal space of the lower end of the upper fragment. The lower segment could be felt riding altogether in front of the upper portion, with its flat surface applied to the front of the lower end of the femur. The lower end of the upper fragment evidently compressed the vessels and arrested the circulation in the leg, which was livid, cold and swollen. There was an inch and a half of shortening. The head of the tibia and the patella were

carried forward with the condyles of the femur. No crepitus was obtainable.

Ether having been administered, and the limb fully flexed, one of my dressers locked his hands behind the femur and exerted traction upward, and another grasping the foot drew the leg downward. I was then able to manipulate the epiphysis, which slipped into position with a distinct sound. The length of the limb was then found to be normal, and the circulation was immediately resumed in the leg and foot. The limb was put up in a suspended Macintyre's splint. January 18, 1892, the limb was taken off the splint and the bone found to be in very good position and firmly united. Plaster-of-Paris was applied to fix the joint. January 19, made an outpatient. The plaster was removed at the end of three weeks, when gentle massage was employed. January 29, 1892, he walked to the infirmary, and there was neither deformity, shortening nor impairment of use in the limb. May 5, 1893, patient shown at the Leeds and W. R. Medical Society, when no sign of the injury could be made out.

CASE II.—*Separation of Lower Femoral Epiphysis, with Displacement Laterally and Forward.*

J. C., aged fourteen, while at the Ida Convalescent Home recovering from a severe compound fracture of the right leg, for which a splint was still being worn, fell, September 6, 1888, while getting about on crutches, with the left leg under the splint of the right. Something in the neighborhood of the left knee was felt by the patient to have given way. When seen he was sitting on the ground, pale and complaining of intense pain in the left knee. The left thigh was flexed on the abdomen, and the leg flexed on the thigh, the whole limb being rotated outward. On measuring from the anterior superior spine of the left ilium to the lower border of the patella, there was found to be slight lengthening on the left side. There was considerable swelling of the joint, and immediately above the upper border of the patella there was a depression. No fracture of the shaft of the femur was made out. The relation of the femoral condyles to the head of the tibia were found to be normal, but the whole joint could be moved much more than normally laterally, and especially outward. This movement was accompanied by a soft cracking sound. The limb was straightened and placed on a back splint, lead lotion being applied to the knee, which was much swollen. September 7, no pain; knee still swollen. September 8, seen by Mr. Littlewood; at that time R. S. O. at the infirmary;

examined under ether; half an inch of lengthening; knee swollen; distinct soft crepitus felt, and extensive lateral displacement just above knee joint. Separation of lower epiphysis of femur, with lateral displacement diagnosed.

Reduction effected and limb placed on back splint. Sent in ambulance to the infirmary September 15, where I saw the case. Limb has been kept on back splint. There is still a good deal of effusion into the knee joint, but this is decreasing under the use of evaporating lotions. Back splint reapplied.

September 25, back splint removed; very little swelling; put up in plaster from ankle to groin. September 27, quite comfortable. Made out-patient. October 20, plaster removed and massage advised. December 15, attended as an out-patient, walking well, without deformity. Patient shown at a meeting of the Leeds and W. R. Medico-Chirurgical Society, May 5, 1893, when no sign of the injury could be discovered.

The notes of a third case have been mislaid, so that I cannot give exact details, but it resembles Case I, and was reduced successfully, a useful limb resulting.

REMARKS.—In nearly all the recorded cases extreme direct violence has been the cause.

The direction of the displacement probably partly depends on the direction in which the violence has been applied, but also on the attachment or otherwise of the gastrocnemius tendon to the lower end of the upper fragment. The diagnosis of such an extensive injury might be thought to be devoid of any difficulty, and in the greater number of cases this cannot be considerable, since the shortening of from one to two inches, the projection of the lower end of the diaphysis in the popliteal space, the displacement of the epiphysis on to the front of the femur, and the interference with the circulation in the leg, when taken together with the cause of the injury and the age of the patient, form a group of symptoms pathognomonic of this form of fracture.

The prognosis would seem to be extremely serious, if we may judge from the reported cases, in many of which amputation had to be performed. The dangers, besides the usual ones consequent on so severe an injury, arise from the pressure of the

lower end of the fractured shaft on the popliteal vessels, interfering seriously with the circulation in the leg, and either producing great œdema or gangrene, or leading to secondary hæmorrhage. As regards treatment, reduction under an anæsthetic would seem to be the plan to try at first, and in case of difficulty reduction might be facilitated by the division of the tendo-Achilles; after reduction, either the long splint, with weight and pulley, or the double inclined plane might be employed. Should reduction be impossible, then excision might be adopted; but if the large vessels be ruptured, or gangrene occur, amputation can be the only resource.

The following cases, with their accompanying diagrams, serve to illustrate different varieties of the accident, each case having required amputation, the illustrations being taken after dissection of the amputated limb.

The specimens are at present in the Pathological Museum attached to the Leeds Medical School.

CASE IV.—The history of this case, which was under the care of Mr. Wheelhouse in the Leeds General Infirmary, is as follows: A. B., aged fifteen, had his leg crushed in a colliery accident. The circulation in the injured member was impeded from the first, and on the forty-third day amputation was performed for gangrene. The drawing (Fig. 3) serves to illustrate the condition.

The specimen, which is now preserved in the museum at the Leeds School of Medicine, shows the lower end of the diaphysis projecting into the popliteal space, and tightly stretching the large vessels and nerve; whereas the detached epiphysis is seen lying with its fractured surface on the front of the femur, its articular surface being directed forward, its anterior margin upward, and its posterior downward. The gastrocnemius is attached to the diaphysis.

CASE V.—Under the care of Mr. T. Hay. F. C., aged six, was run over by a cab, and brought to the Infirmary, where it was found that compound diastasis of the lower epiphysis of the femur had occurred, with severe laceration of the soft parts. The lower end of the diaphysis projected through a wound in the popliteal space, while the epiphysis was displaced forward. Primary amputation of the thigh was performed with a good result.

The accompanying drawings show the front and side view of the diastasis, which is preserved in the school museum.

Fig. 4 shows a clean and complete detachment of the lower

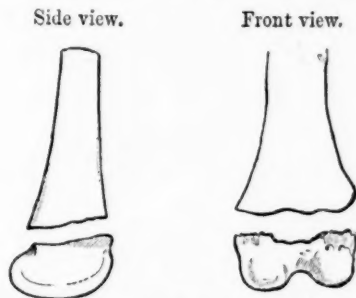


FIG. 3.—Separation of lower epiphysis of femur with forward displacement.

epiphysis of the femur. The muscles of the leg have been dissected in order to show the relation of those of the calf to the epiphysis itself. The lower half of the femur has been cleaved, in order better



FIG. 4.—Separation of lower epiphysis of femur.<sup>1</sup>

to exhibit the form of its epiphysal end. The specimen was obtained by a primary amputation in the case of a boy, aged fourteen, under Mr. Hutchinson's care some years ago in the London Hospital.

<sup>1</sup> From Mr. Hutchinson's Archives of Surgery for January, 1893, p. 287.

## OSSIFYING HÆMATOMA.

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THE patient, N. D., twenty-two years of age, of good habits and condition, came under my observation in May, 1891.

The family history reveals no tubercular or syphilitic disease, and on inquiry a former statement of the patient, that some members of his family were prone to bleed freely from slight injuries, could not be verified.

His personal history is good; he has always been strong and healthy; there is no history of a hæmorrhagic or osseous diathesis.

About the middle of April, 1891, he was sparring with a friend, when the latter boasted that he could by a single blow paralyze his arm in such a way that he could not raise it. The patient disputed this, and held his right arm out horizontally, inviting his friend to strike it. This the latter did with great force, and not succeeding in accomplishing his object at the first blow repeated it again and again, several times, without, however, disabling him.

At the time no further thought was given to the occurrence. But two days subsequently he came to the Good Samaritan Dispensary, in this city, complaining of soreness and swelling of the right upper arm.

At this time the region immediately below the insertion of the deltoid was the seat of a large, soft, fluctuating tumor, extending inward toward the biceps muscle. The right arm at this point showed an increase in size over its fellow of about 10 centimetres (the circumference being about 46 centimetres). The skin of the arm was bluish, and the parts beneath were somewhat tender to pressure and manipulation.

A diagnosis was made of contusion of the arm with effusion of blood, and treatment with massage was advised. The patient was permitted to work, and did not lose a day's work during the following six weeks.



He was subsequently seen, once or twice, at intervals of a few days. During this time the tumor diminished slowly in size, the function of the arm improved, all pain disappeared, and the skin regained its normal color. The treatment was, therefore, continued.

He next again came under my observation on the 20th of May, 1891, about six weeks and a half after the injury. His general condition was good, and he complained of no pain. The tumor had decreased in size to about one-third of its original dimensions, the right arm now measuring  $32\frac{1}{2}$  centimetres against  $26\frac{1}{2}$  on the left side. It was somewhat more elongated than when first observed, apparently having shrunken more transversely to the line of the humerus than longitudinally. The most remarkable change undergone by the tumor was its induration. It presented a bony hardness throughout, although the apices of the tumor were relatively somewhat harder to the feel than the middle portions. This hard mass was evidently in close connection with the bone, and could not be moved longitudinally nor laterally.

The tumor had displaced the belly of the biceps muscle to the inner side of the arm (where it still lies), occupying the region of the brachialis anticus muscle.

The function of the arm was somewhat interfered with, flexion at the elbow being limited to about seventy-five degrees.

About this time the patient was seen by Dr. V. P. Gibney, at the New York Polyclinic, and an aspirating needle was thrust into the tumor under antiseptic precautions. But although the needle entered into the mass of the tumor the result was negative: it was a dry tap.

Dr. Gibney, I believe, did not commit himself to a diagnosis. My own diagnosis was that of hæmatoma ossificans, ossifying periostitis being ruled out on account of the great fluctuating mass present at the commencement of the history, and of the tendency of the tumor to shrink. Ossifying myositis, however, was also thought of as a diagnosis, on account of the close connection of the tumor with the muscles, and the apparent ossification in the upper portions of the muscles involved.

On May 27 the patient was presented by me to the New York Surgical Society,<sup>1</sup> the previous history being narrated, and the diagnosis of ossifying subperiosteal hæmatoma being made.

<sup>1</sup> New York Medical Journal, 1891, 54, 638.

Of the gentlemen who were kind enough to look at the tumor Dr. B. F. Curtis agreed with me in the diagnosis. The president, Dr. Briddon, however, thought that the time since the injury had been too short for a deposit of bone of the size presented to have taken place. Dr. F. Lange believed the tumor to be an osteo-sarcoma, and pointed to the frequency with which these malignant growths appear after traumatisms. He recommended cutting down upon it for diagnostic purposes.

This it had already been decided to do, and on June 22 the patient was admitted to the New York Cancer Hospital. Dr. Curtis kindly assisted me at the operation. Ether being administered, an Esmarch bandage applied at the shoulder, and antiseptic precautions maintained, an incision was made over the mass of the tumor, extending from a point internal to the insertion of the deltoid downward and outward toward the external aspect of the elbow, and about 12 centimetres in length. Dissection to the bone between the biceps and the brachialis anticus exposed a mass of apparently solid bone, continuous with the humerus, about 9 centimetres in length, and 3 centimetres broad and high.

This bony mass had taken the place of the intra-muscular ligament or septum, and had invaded the origin of the brachialis anticus, so that the fibres of the muscle adhered directly to the new growth, and it was consequently difficult to say where the muscle ended and the bone began. The periosteum could not be lifted off from the tumor with the muscles attached, but appeared continuous with it; nor was it possible to say where the periosteum ended and the bone commenced.

The muscle fibres of the brachialis being stripped off from the superficies of the tumor with the scalpel and sharp elevator, the tumor was removed with the chisel and mallet in two portions. The chisel entered with some difficulty through the ossified external coat of the tumor, which was nearly  $1\frac{1}{2}$  centimetres in thickness, into a cavity; and this appeared filled with partly coagulated blood of a dark brown color; at the bottom of this cavity the bone was porous and bled on being scraped.

The bony hardness of the walls of this cavity was most marked near the periphery of the tumor; advancing toward the central cavity, the induration gradually decreased.

After the entire mass of bone forming the tumor had been removed and the bleeding points secured after removal of the Esmarch



bandage, the cavity was irrigated with a 1 in 5000 solution of corrosive sublimate and the soft, clotted blood washed away; a small drainage tube was introduced, and the wound closed by interrupted and continuous sutures.

The wound was dressed with iodoform powder and gauze, and the patient recovered without any pain or rise of temperature, the wound healing by primary intention. All sutures were removed on the seventh day, and the patient discharged cured on June 12, 1891, on the eighth day after the operation. There was still some impairment of function of the arm, especially in flexion at the elbow.

The patient was again seen by me May 4, 1893, about two years after the injury. There had been no return of the trouble at any time; the function of the arm was perfect, the scar plainly visible, broadened, but healthy. The circumference of the right arm was still somewhat increased, its measure being  $27\frac{1}{2}$  centimetres against its fellow 26 centimetres, and this increase in size was due to the remaining enlargement of the bone. There was no sign of ossification in the tendons of any of the muscles. The biceps muscle still remained somewhat displaced toward the inner side of the arm.

The specimen removed was sent to the pathologist (Dr. Freeborn) for examination, who reported "ossifying periostitis." Unfortunately, the tumor has been lost at the laboratory, and I am unable to present the specimen.

Such cases as the one just narrated present some interest in the matter of diagnosis and prognosis, and this is what has led me to bring the subject before the Society.

This case possesses features common to several different pathological conditions, and in making a diagnosis in the light of the entire history of the case, it is requisite to differentiate between exostosis or osteoma, periostitis, myositis ossificans, osteo-sarcoma and ossifying hæmatoma.

Osteoma may be considered together with periostitis ossificans, the osteomata occurring on the shaft of the bone being generally designated as periosteal exostoses, and originating through proliferation of the deeper layers of the periosteum (although Billroth declares that these osteophytes are produced by the bone proper as well<sup>1</sup>).

<sup>1</sup> Billroth, *Allgem. Chir. Pathol. and Therap.*, 1880, 516.

According to H. Fischer<sup>1</sup> and Virchow, however,<sup>2</sup> these periosteal exostoses never develop until after the thirtieth year (unless, indeed, they occur before the age of twenty, and in syphilis and other diatheses). Moreover, such a tumor, when first noticed, would have been smaller than at a subsequent time. In the present case, however, the tumor was at first very large, and gradually grew less in size and became harder. Again, the cavity of the tumor, if it were a cancellous exostosis, should have contained bone-marrow, and not merely clotted blood, as it did at the time of operation.

An exostosis of the size of the tumor operated upon would probably have taken a longer time than six weeks to develop. Moreover, in exostosis pure and simple, we could not account for the participation of the muscles and ligaments in the ossification.

As to periostitis, if we mean by that the insidious, mild, proliferating osteogenic inflammation of the periosteum, this would be more readily compatible with the formation of bone found at the time of operation in the intra-muscular septa and in the muscle. (Virchow's parostosis.)

But the periosteum would have been thickened and reddened and rendered cloudy, and would be easily seen and detached from the bone at the time of operation.

Ossifying periostitis would not have presented a fluctuating, comparatively painless tumor in the first days after the injury, nor would a cavity filled with clotted blood be found in the centre of the growth.

Myositis ossificans is more difficult to exclude as a diagnosis. The commencement of the affection with repeated traumatism, the development of bone in the intra-muscular septum, and the ossification of the origin of the brachialis anticus muscle, all point to myositis ossificans. We know that in this disease the bone-formation occurs in the connective tissue, enveloping the muscle fibres and not in the fibres proper.<sup>3</sup>

<sup>1</sup> H. Fischer, *Lehrbuch d. allg. Chirurgie*, 1887, 876.

<sup>2</sup> R. Virchow, *Die Krankh. Geschwuelste*, 1864, 2, 88.

<sup>3</sup> Cahen, *Ueber myositis ossificans*; *Deutsche Zeitschr. f. Chir.*, 31, 372, 1891.

Myositis ossificans, however, commences independently of the bone, as small circumscribed lamellæ of bone imbedded in the muscle, or its tendon. The "rider's bone" and "exercise bones" of the literature<sup>1</sup> begin in this way, are mostly independent of the bony skeleton and grow gradually in size, instead of decreasing, as our tumor did.

Moreover, the periosteum is always found to be in a normal condition under these ossifications in the muscle, and this was not the case in our bone. Myositis ossificans also frequently shows a tendency to progress, which was not apparent in the present case, the patient being now entirely recovered.

But what especially argues against myositis ossificans is the finding of a cavity in the centre of the tumor filled with clotted blood. Indeed, it is not probable that a needle could have been introduced for the purposes of aspiration into the formations of ossifying myositis.

The diagnosis of osteo-sarcoma was made probable by the gross appearance of the tumor. Its unequal hardness (being somewhat softer to the feel in the middle portions than at the lateral points), the firm connection with the bone, the encroachment upon the soft tissues covering it, the displacement of the biceps muscle to the inner aspect of the arm, the age of the patient, the size of the tumor, and the unchanged condition of the skin over it, all would naturally suggest sarcoma, and with it amputation.

The microscopical examination, however, revealed only normal osseous structures. Moreover, the patient has made a complete recovery.

With the diagnosis of ossifying hæmatoma, however, everything in the history and examination of the patient tallies, it being only necessary to postulate that the hæmorrhage was, partially at least, sub-periosteal.

The acute origin of the swelling after the severe pounding of the arm by the patient's friend; the bluish discoloration of the skin over the parts affected when the patient first presented him-

<sup>1</sup> For literature of myositis ossificans vide Ziegler, *Patholog. Anatom., Spec., Theil.*, 1892, 259. Oliver, *Cincinnati Lancet Clinic*, 1891, U. S., 26, 526.

self for treatment; the very slight tenderness of the parts in proportion to the amount of tumefaction; the slight interference manifested with the patient's exercise of his daily avocations; the good effects of the use of massage in reducing the size of the tumor within the first few days after his injury; the gradual induration of the tumor and its ossification, and this the most marked at the periphery of the swelling and within a comparatively short period of time; the close connection of the tumor with the bone; the persistence of a cavity in the central part of the tumor and the presence in this cavity of clotted blood; the negative result in the attempt to tap the tumor thus filled with clotted blood; the outgrowth of the bony mass into the external muscular septum and into the muscle fibres of the muscles attached to the periosteum at the injured place; the difficulty of distinguishing the exact point where the periosteum joined on to the bone; the uninterrupted recovery and healing of the wound by first intention under aseptic treatment; and lastly, the freedom from recurrence which the patient enjoys: all these considerations readily accord with the diagnosis of ossifying hæmatoma.

It may not be amiss to point out that the large foramen nutricium of the humerus lies directly beneath the region where the blows were received. This would account for the unusually large size of the effusion and its localization beneath the periosteum; a localization to which, moreover, both the displacement of the biceps muscle to the inner side and the failure to procure complete absorption of the hæmatoma by massage, as well as the initial fluctuation observed in the tumor, specially point.

It is true, and I am fully aware of the fact, that the hand-books of surgical pathology do not teach that a hæmorrhage of the kind here reviewed can ossify.<sup>1</sup> No mention of cases similar to this one is made in the current surgical literature which I have consulted, and in the encyclopædias I have failed to find any hint of such a process.

We know, however, that traumatic hæmorrhages which take

<sup>1</sup> Heinecke (*Deutsche Chirurgie*, 1885, Lief. 18, p. 57) says: "Large encapsulated extravasations beneath the periosteum of a bone *still growing*, may become enveloped with a bony capsule, as in the newly born."

place beneath the periosteum of the cranium in young children lead to the formation of new bone, which takes the place of the effusion of blood.

Cohnheim, also, in his work on general pathology, points out that circumscribed hæmatomata are hardly ever entirely absorbed,<sup>1</sup> but produce a mild inflammatory action in their environment—which we may term regenerative activity—which leads to the so-called organization of the blood clot.

To surgeons the formation of bone in a blood-clot is by no means a new and startling idea. The organization of the effusion of blood, which we permit to fill a bony cavity after sequestrotomy or similar operations, is familiar to most of us, since Schede's report at the German Surgical Congress in 1886;<sup>2</sup> and when the blood is supplied from the walls of the bone cavity, newly-formed bone is actually substituted for the blood clot.

I have not been able to find in the literature accessible to me, any description of the more minute histological processes involved in the ossification of a blood clot, although von Volkmann mentions<sup>3</sup> that Kraske examined cases of organization of clots. I believe, however, it is generally accepted that the osteoblasts from the bone play an important rôle in these cases, by causing the organization of the clot to progress toward the formation of new bone; and we are familiar with the experiments of Cohnheim and Maas<sup>4</sup> and others, by which bone was produced in the tissues from detached periosteal fragments.

<sup>1</sup> Cohnheim, *Allgem. Pathologie*, 1877, I, 331.

<sup>2</sup> *Verhandlungen der Deut. Ges. für Chir.*, 1866, 15, 62. Clinical observations on organization of blood clots are reported by Volkmann (*Beiträge zur Chirurgie*, Leipzig, 1875); Phelps, Siepmann (*Deut. Med. Wochschr.*, 1887, 1094); Mikulicz (*Przegląd lekarski*, 1877, No. 1); Hennewig (*Inaug. Diss.*, 1888); Wilms (*Inaug. Diss.*, Berlin, 1888); Lauenstein (*Archiv. für Chirurgie*, 1888, 37, 634); Mosetig von Moorhof (*Wiener Presse*, 1888, 6); Halstead (*The Johns Hopkins Hospital Reports*, 1891, II, 255), where the following foot-note occurs: "Experiment upon a dog. We removed a piece of the triceps muscle and trephined the external condyle of the humerus. The wound was allowed to fill with blood, and was covered with the gutta-percha tissue. No stitches were taken. The extremity was immobilized in a plaster-of-Paris splint. In three weeks the plaster was removed. The defect in the bone was so perfectly repaired that it was impossible to see with the naked eye a line of demarkation between the old tissue and the new."

<sup>3</sup> *Verhandlungen der Deut. Ges. für Chir.*, 1866. Discussion.

<sup>4</sup> Cohnheim, *l. c.*, p. 670.

When viewed in this light, I believe that many of those cases of new osseous growths, the pathology of which has hitherto remained obscure, may be more satisfactorily explained. When the periosteum has been lacerated, or even contused by traumatic insults, is it not probable that the effused blood, which surrounds the muscular fibres adjoining the bone and saturates the connective tissue of the ligaments, should possess similar properties, carried with it from the bone, of causing ossification in these points? And may not this be an explanation of some cases of "exercise"—or "rider's" bone, at least more satisfactory than any theory of the formation of neoplasms through inflammatory action—against which theories most pathologists so earnestly contend?

However this may be, in applying the explanation given above, of the ossification of a blood clot in a traumatism affecting the bone, by organization and substitution of new bone for the clot, to the case at present under consideration, we have rendered all the symptoms and the whole course of the affection readily intelligible.

Nor is the pathologist's report of ossifying periostitis in any way incompatible with this diagnosis of hæmatoma ossifying during organization. For the inflammatory reaction found in the immediate vicinity of a large effusion of blood is of exactly the same mild, regenerative character which, when present in the bone and the periosteum, lead, under favorable circumstances, to the production of new bone tissue.

We imagine, therefore, that at the time of the injury blood was effused in the entire part of the arm injured; not only between the muscles, but also under the periosteum. This latter may have been injured further. The greater part of the blood, and especially that effused nearer the skin, was, to a great extent, absorbed by massage. The part near the bone, however, remained unabsorbed, became clotted, and began to organize, with formation of new bone. After six weeks and a half this process had so far progressed that the peripheral parts of the tumor had become ossified, while the centre still remained soft. Six weeks appears ample time for this when we consider that often after



large sequestrotomies recovery is complete in an equal period, when the method of healing under the moist blood clot has been carried out.

After removal of the growth, no further hæmorrhage being permitted, the patient made a rapid and complete recovery.

I therefore believe it to be of no little importance to bear the possibility of ossification of hæmatomata situated near the bone in mind in diagnosing tumors of the extremities, and the more especially since these forms frequently simulate malignant tumors.

UNILATERAL LARYNGECTOMY: A CASE OF EXCISION OF THE RIGHT HALF OF THE LARYNX FOR CARCINOMA; RECOVERY; NO RECURRENCE AT THE END OF A YEAR.<sup>1</sup>

By GEORGE H. MONKS, M.D.,

SURGEON TO THE CARNEY HOSPITAL; SURGEON TO OUT-PATIENTS AT THE BOSTON CITY HOSPITAL, AND ASSISTANT IN CLINICAL AND OPERATIVE SURGERY AT THE HARVARD MEDICAL SCHOOL.

ON May 17, 1892, at the Carney Hospital, I excised the right half of the larynx in a man thirty-nine years of age. The operation was done for the removal of an epithelioma involving the right vocal cord.

The after-treatment, so important in cases of this kind, was carried out with the most conscientious attention to details by the House Surgeon, Dr. F. J. Giblin, and the Sisters at the hospital. The recovery from the operation was speedy and uninterrupted, and the patient left the hospital twenty-five days after the operation with an ordinary silver tracheotomy tube tied in the wound. Soon after this he resumed his occupation (that of a photographer), and, ever since, has been able to earn his former wages.

Shortly before he left the hospital the patient was able to talk intelligibly in a hoarse whisper, and since then his voice has gradually improved in strength and tone. After removal of the tube he pulls together the edges of the wound in his neck, or covers it over with a pad or with his finger tips; and the current of air is thus driven through what remains of his larynx into his mouth, and his phonation, though hoarse, is excellent. Lately I have had made for him a tracheotomy tube with a fenestra in its upper part, and, with this in position, he can talk satisfactorily

<sup>1</sup> This patient was shown at the Congress of the American Surgical Association, in Boston, June, 1892, and, somewhat later, at that of the American Laryngological Association. The case was reported in full, and the patient again shown at the meeting of the Surgical Section of the Suffolk District Medical Society, February 1, 1893.



when the outer opening of the tube is plugged. He generally uses a cork for stopping this aperture. It is now about one year since the operation, and there is no sign of recurrence, and the patient enjoys excellent health.

#### A DETAILED ACCOUNT OF THE CASE.

Some time previous to the operation this patient had been under the care of Drs. J. W. Farlow and W. F. Knowles in the out-patient department at the hospital.

The man had had marked and persistent hoarseness for about a year. When the case was first seen by Drs. Farlow and Knowles, the right vocal cord was somewhat thickened and reddened, and its movement during respiration and phonation was extremely limited.

For a long time the case was carefully watched, and various methods of treatment, both local and general, were faithfully tried. In spite of this the voice remained husky, and the immobility of the right vocal cord became even more pronounced.

In all other respects the man seemed to be well and strong. He never had marked pain in his throat or difficulty in swallowing. No cachexia was present. The family history revealed no trace of cancer.

About this time I was asked to see the case in consultation, with reference to a surgical operation, looking to the partial or complete removal of the larynx.

The case seemed to be a favorable one for operation. The growth was apparently confined to one side of the larynx, and no enlargement could be detected in the cervical glands. The neck was long and thin, and the larynx very prominent—just such a neck, in fact, as one would prefer in case a laryngectomy were to be performed. In view of all the circumstances it was decided that an operation was justifiable—in fact, that the right half of the larynx, and all the soft parts within it, should be removed.

A careful explanation was made to the patient, who was a remarkably intelligent man, as to the probable course of the disease if left to itself, and as to the prospects in case an operation should be done.

After a few days' deliberation he returned to the hospital to say that he had decided to undergo the operation and to put himself in our hands.

A private room at the hospital was prepared for him. It was thoroughly cleaned and aired, and the bed was placed near the middle of it. The upper end of the bed was covered with a light canopy to keep off the drafts, and a steam jet was so arranged that the air under the canopy should be sufficiently warm and moist. The temperature of the room itself, when all was in readiness for the patient, was about  $75^{\circ}$  F., and until the patient was practically out of danger after the operation it was never allowed to go lower than this, or above  $80^{\circ}$ . Arrangements were also made for a special watch through the day and night.

The patient was given an ounce of castor oil on the night before the operation, and an enema in the morning. The entire neck and vicinity were sterilized and enveloped in an antiseptic dressing. At the operation I was assisted by Dr. Knowles and Dr. H. W. Cushing. When the patient was thoroughly etherized, several pillows were placed under his shoulders so as to allow the head to fall back and fully expose the front of the neck.

Two straight incisions were made; the one (vertical) in the median line of the neck from the hyoid bone to about an inch and a half below the cricoid cartilage, the other (horizontal), on the right side of the neck, about the level of the lower border of the thyroid cartilage. This second incision joined the first at right angles. Part of the sterno-hyoid muscle was divided in the transverse incision.

The thyroid and cricoid cartilages on the right side were laid bare, the soft parts having been carefully dissected away from them.

The adjacent (the right) half of the back of the cricoid was then separated from the anterior wall of the œsophagus, so that after the operation was finished the œsophageal wall might be left intact as high up as possible, and the liability to regurgitation of food diminished.

After the bleeding was arrested the trachea was opened at the lowest part of the wound, just below the cricoid cartilage,



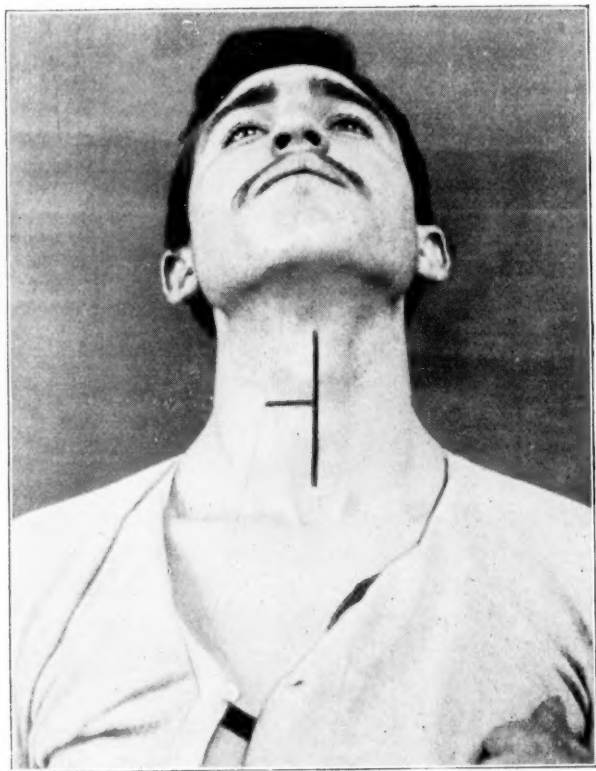


FIG. 1.—Showing lines of external incision.

and a large-sized silver tracheotomy tube inserted. The whole larynx was then split in front, in the median line, and the two halves held apart, while gauze was packed into the lowest part of the cavity firmly upon the tracheotomy tube. The cavity of the larynx having thus been shut off from the trachea the entire right half of the larynx was removed, the incisions beginning from below.

First, the right half of the trachea was divided just below the cricoid cartilage; then the knife was placed within the larynx, and the posterior part of the cricoid cartilage split vertically in the median line from the front.

The thyroid cartilage was then carefully separated from its attachments to the soft parts behind, and, after this, the thyrohyoid membrane was divided. Lastly, the superior cornu of the thyroid cartilage was pulled down and cut out. In all this dissection the edge of the knife was kept as close as possible to the cartilages.

Thus, the entire right half of the larynx was removed, including one-half of the thyroid and cricoid cartilages, the cricothyroid membrane, the right arytenoid cartilage, the right vocal cord, and the other soft parts belonging to the right side of the larynx. Care was taken, when separating the thyroid cartilage at its anterior superior angle, to preserve as much as possible of the base of the epiglottis.

An examination of the specimen after removal showed that the growth had not been fully removed, and that a part of it, which had extended across the median line in front to the other side, had been left at the anterior end of the left vocal cord. This portion was removed by the scissors, which were made to cut well into the sound tissues about the growth.

The bleeding during the operation was not excessive, but troublesome on account of the difficulty in preventing the blood from running down the trachea after the gauze about the tracheotomy tube had been saturated. Elevating the foot of the table kept the blood from the trachea, but, as this expedient greatly increased the hæmorrhage, it had to be abandoned.

The wound left, after the parts above mentioned had been

removed, was large and irregular, and at its upper part communicated freely with the pharynx and œsophagus. A large-sized soft rubber stomach tube was passed from the wound through this opening well down into the œsophagus. Iodoform gauze was packed into the wound about this tube, and the skin edges above it were then approximated by silk sutures.

The patient stood the operation very well, and he was taken to his room with two tubes in his neck, the one leading to the œsophagus and the other to the trachea.

The resected portion of the larynx was sent to Dr. E. M. Greene, the pathologist of the hospital, and a few days later the following report was returned: "The specimen . . . showed a considerable increase in the size of the vocal cord. No ulceration was observed. Microscopical sections showed the normal tissue of the cord to be almost entirely replaced by a new growth made up of irregular masses and nests of large epithelial cells. Here and there broken-down muscular fibres were seen, surrounded by the growth. Diagnosis: Epithelioma."

The patient recovered quickly from the ether, and complained of no pain or distress, except when he made the motion of swallowing.

During convalescence the chief difficulty experienced was in preventing the discharges at the wound from trickling down the trachea and causing irritation and cough. There was also some trouble in carrying out proper alimentation.

For the first few hours after the operation there was a good deal of coughing, and mucus mixed with blood was expectorated in large quantities. Finally, the foot of the bed was raised, and this procedure was found to be so efficient in keeping the bulk of the discharges out of the œsophagus that the bed was kept in this position, day and night, for about a week.

On the day after the operation the rubber stomach tube was removed, and for a day a large-sized soft rubber catheter was put in its place. After this, whenever it was necessary to feed the patient, the catheter was introduced through the wound into the œsophagus, and liquid food administered through it. The patient was fed, every three hours or so, with egg-nog, whiskey

and milk. He did not like beef-tea. At first there was some regurgitation through the œsophageal wound, but this was largely prevented by pressing a plug of gauze against the wound during the act of swallowing.

On the day after the operation the silver tube was removed from the trachea, and a glass tube, with an inflated rubber jacket about it, put in its place. This contrivance, which I devised after the plan of Trendelenberg's canula, answered the purpose admirably, and was used until the troublesome mucous secretion and the accompanying cough had largely subsided. Had I thought of making such a tube before I should certainly have used it during the operation, and possibly throughout, in preference to the ordinary tracheotomy tube. This tube can be made very rapidly, and with little or no expense, somewhat as follows:

A piece of glass tubing about four inches long, and having a calibre of about a third of an inch, is bent at an oblique angle near its middle in such manner as not to interfere with the calibre of the tube. A long rubber finger, such as can be procured in any rubber store, is nicked in two places—at the tip of the finger and at a point one side near the open end. The glass tube is then pushed through these two holes and the rubber tied firmly about it. A little glass tube is inserted at the open end of the finger, and this end is tied closely upon it. A rubber tube is attached to the small glass tube, and a small spring clip put on.

The rubber jacket can then be inflated, when in position, by an air-bulb, after which the spring clip is set and the bulb detached.

On the fourth day after the operation the temperature was  $100^{\circ}$ , the highest point during the whole course of the case. This temperature was speedily brought down by an enema, which was followed by a copious dejection. The glass tracheal tube was removed for good on the fifth day. The same day some ale was given to the patient through the œsophageal catheter. This seemed to stimulate him in a most satisfactory manner. A spray of benzoinol and guaiacol, administered from time to time, afforded great relief.



On the ninth day fine bits of beefsteak were chewed and swallowed with evident relish, but the tube was still necessary when fluids were taken. On the tenth day the patient sat up for a while in a chair, and about this time it was noticed that he could talk in a rough whisper by closing the opening in his neck.

Later, the opening showed a tendency to close, and it was thought best to keep an ordinary tube in the tracheal wound.

Soon after the patient left the hospital he acquired the power of swallowing liquids without the use of the catheter, and without regurgitation through the wound, so long as slight pressure was kept up at the opening into the *œsophagus*.

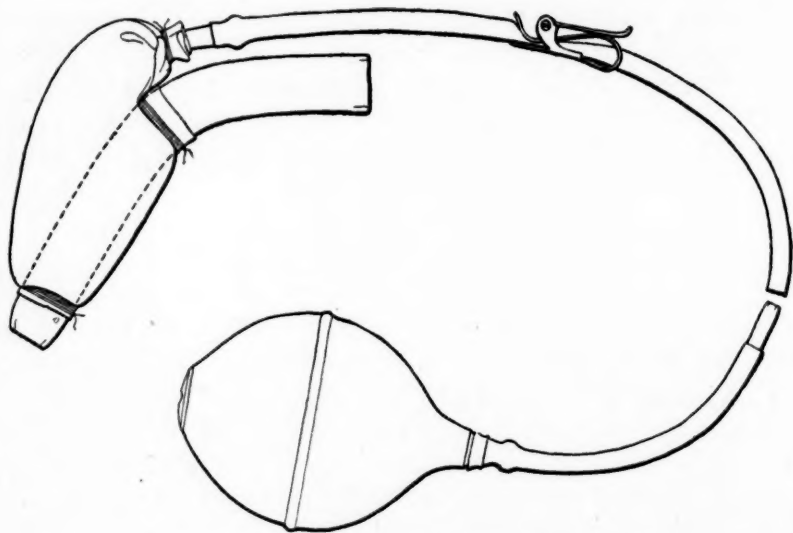


FIG. 2.—Glass trachea tube with rubber jackets inflated.

Figures 3 and 4 are from photographs of the patient taken about a year after operation. The contraction of the parts during cicatrization forced the tracheal tube from the opening, which was originally made for it in the trachea, up into the larger wound which was left because of the removal of part of the larynx. This accounts for the fact that in these cuts the opening for the tube appears to be somewhat to the right of the median line. Though the tube now occupies a higher position than before, it



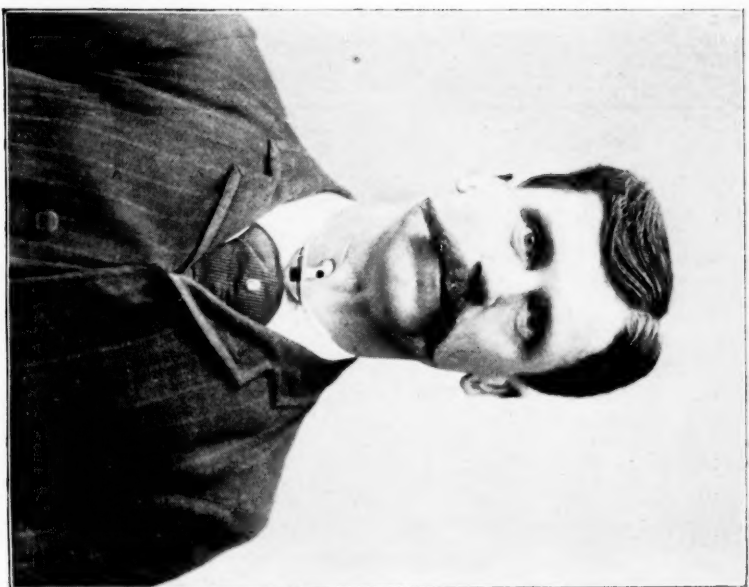
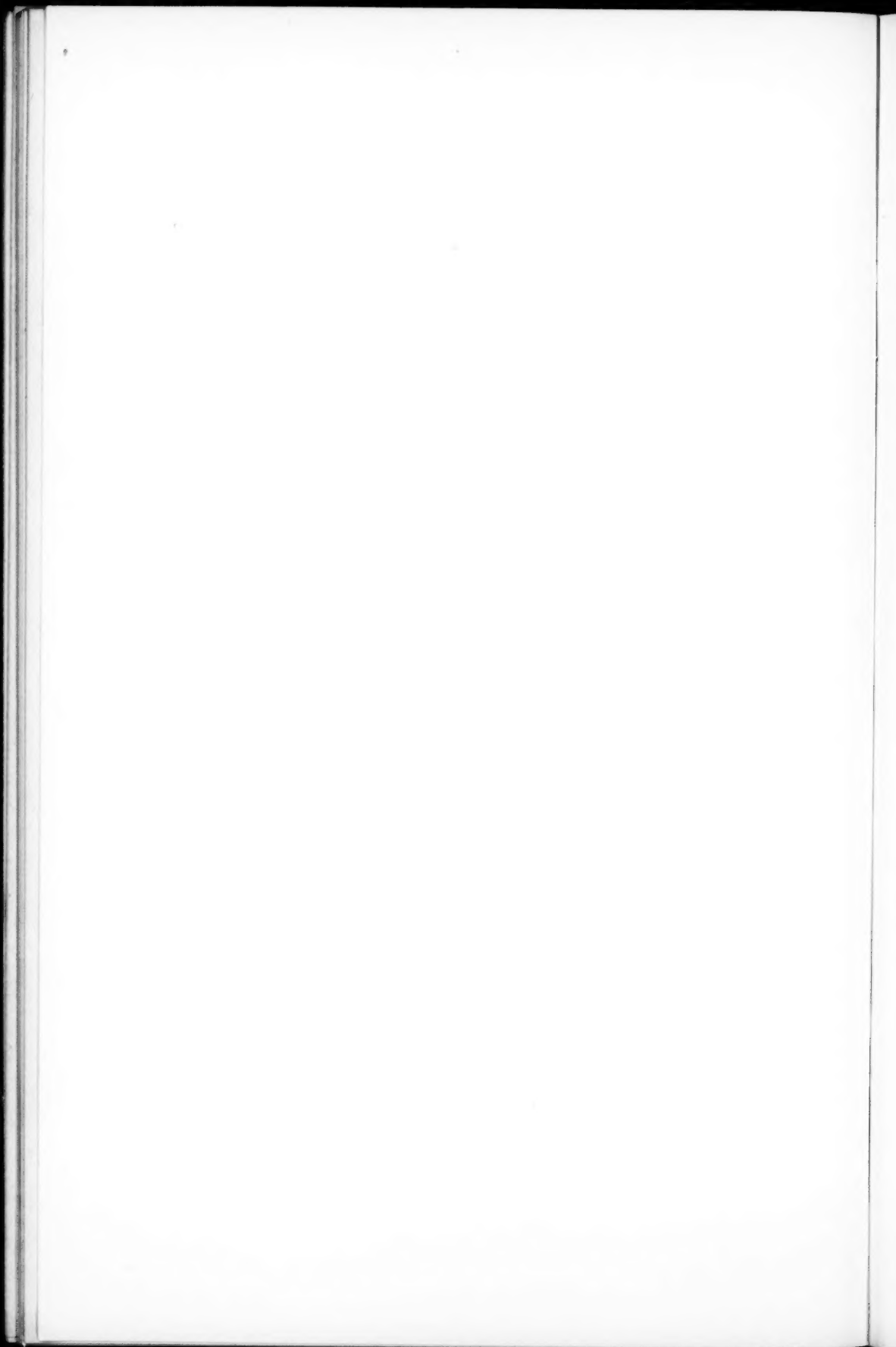


FIG. 3.—The canula resting in the tracheal opening.



FIG. 4.—The present condition of the operation field.



does not touch the left vocal cord, a circumstance which would seriously interfere with phonation when the tube was in place.

Figure 4 shows the tube about to be introduced. The tip is within the wound, and the broad shield rests upon the collar of the patient. The fenestra on the upper curvature of the tube is plainly shown, and a cork has been placed in the outer opening. The patient wears this tube day and night, only removing it for the purpose of cleaning it. It is held in place by a tape about the neck.

This patient breathes easily, talks intelligibly, sleeps and eats well. He does as much work, and for the same remuneration, as was the case before he lost half of his larynx. He seems to be thoroughly satisfied with the results of the operation.

#### REMARKS.

This case seems to me worthy of being recorded if for no other reason than that it shows that removal of half the larynx, in favorable cases, is not inconsistent with the subsequent comfort and usefulness of the patient, without any great loss of natural voice and without recurrence for a long period of time.

REPORT OF A CASE OF HYDRENCEPHALOCLE  
SUBJECTED TO EXCISION; RECOVERY.

By CHARLES H. MAYO, M.D.,

OF ROCHESTER, MINN.

SURGEON TO ST. MARY'S HOSPITAL.

**A**N infant, George C., aged one and a half years, was received into St. Mary's Hospital, Rochester, Minn., March 29, 1893, with the following history: He was the first child of healthy parents, and had been born with double equinovarus and a pulsating tumor projecting outward from the median line in the occipital region about the size of a walnut, which has since gradually increased in size. The child has been irritable, but in fair health. The tumor has always pulsed and been exceedingly tender on manipulation. It is of interest to note that a brother of this child, three years of age, also has congenital club feet.

*Present Condition:* A bright, fairly-nourished child, with a spherical tumor, pulsatile in character, the size of a small orange, projecting centrally from the occipital region; also having well-marked, congenital club feet. The tenderness of the protuberance necessitated chloroform anæsthesia for careful examination. The crest of the tumor was apparently very thin, white and glistening in appearance, and a few veins could be seen coursing over its surface. The sides were evidently much better protected. On the right base was a considerable thickening, evidently connected in the past with the cranial contents through a lateral fissure from the central opening.

The opening through which the hydrencephalocle sprang was evidently about the size of the tip of the index finger.

*Operation:* April 1, 1893. After the usual preparation for the previous three days and under chloroform anæsthesia two scalp flaps were dissected off from the sides of the tumor and the dura mater freed to the bony opening, the sac was opened, allowing the escape of about an ounce of cerebro-spinal fluid, normal in appearance. The opening leading inward and slightly to the right probably communicated with the right ventricle. The sac was composed of dura mater, and near the base, spreading out thinly on the sides, was evident

atrophied cerebral tissue. The neck was ligated with heavy catgut, the entire sac cut away, the tissues around the stump securely sutured over it by buried sutures, the two flaps sutured in apposition, and a dry dressing applied. During application of the dressing the child vomited, and the increase in intra-cranial pressure caused a marked left-sided spasm, lasting several minutes. Five grains of calomel were administered with rapid effect, and the child made an uneventful recovery, being apparently much relieved by the operation. At the end of two weeks the child was discharged, the wound firmly united and with no apparent pulsation at the seat of operation.

Operations in meningo-encephalocele or hydrencephalocele have been rarely successful. Von Bergman, in his classical work on the "Surgical Treatment of Diseases of the Brain," published in 1890, could find but few cases where the results were even encouraging. During the past two years several successful cases have been reported by Horsley, of England; Mazzucchelli, of Italy; Cabot, of Boston, and others. Considering the absolute fatality of non-operative methods of treatment, these few successful cases assume importance and place operative procedures upon a firm basis.

REPORT OF A CASE OF VOLVULUS OF THE SIGMOID  
FLEXURE OF THE COLON SUCCESSFULLY REDUCED  
AFTER ABDOMINAL SECTION.

By WILLIAM J. MAYO, M.D.,

OF ROCHESTER, MINN.

SURGEON TO SAINT MARY'S HOSPITAL.

THE patient, Mrs. M., aged fifty, was an inmate of the 2d Hospital for the Insane, Rochester, Minn., suffering from chronic mania. *History:* Like most insane she had been chronically constipated, but was otherwise in good health until April 1, 1893, when she was suddenly seized with vomiting, and symptoms of acute obstruction of the bowels, which in spite of treatment grew worse.

She became tympanitic, with quick pulse and moderate elevation of temperature. On the evening of the third day, April 3, 1893, I was called to see her by Dr. A. G. Kilbourne, superintendent of the asylum, with a view of operative interference. I found her lying in bed with her knees drawn up, her face pinched, and expression anxious. Pulse, 114, and temperature, 100°. Abdomen exceedingly distended, especially in the centre, where there was a peculiar ovoid enlargement of great size. A little chloroform was administered, and the left hand was introduced into the rectum. With my left index finger a tight constriction was found at a depth of about eight inches, just to the left of the sacral prominence. A few hours later, after the usual preparation, and under ether anæsthesia, a fine incision was made in the linea alba below the umbilicus, and a huge distended viscus at once presented. Its size was so great that at first it was thought to be the greatly distended stomach, but was recognized as the colon by its glandulæ epiploicæ and longitudinal bands. An incision was made into it, and a large quantity of gas and some fluids evacuated, sufficient to relieve the distention, and allow careful examination, which showed one complete turn of the sigmoid upon itself, from left to right, and a crowding of a considerable portion of the transverse colon into the right pelvic region. The balance of the

colon and small intestines were but moderately distended. The confined part of the sigmoid flexure was dark and congested, it having furnished the greater part of the previous abdominal distention. A few Lembert sutures closed the incised bowel, and reduction with replacement was, with moderate difficulty, accomplished. As soon as the patient had recovered from the anæsthetic ten grains of calomel were administered, followed in a few hours by profuse discharge from the bowels and an uneventful recovery.

The comparative rarity of this form of obstruction, its typical history, and the complete reduction renders the case of interest. In the larger number of cases reported by Treves and Greig Smith reduction was impossible.

## TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

*Stated Meeting, April 12, 1893.*

The President, ARPAD G. GERSTER, M.D., in the Chair.

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### OLD UNUNITED INTRACAPSULAR FRACTURE OF NECK OF FEMUR TREATED BY NAIL FIXATION.

Dr. WILLY MEYER presented a man, thirty-nine years of age, who when seen in November, 1892, gave a history of having fallen ten months before from a height of sixteen feet, and had since been an invalid. On examination, the left leg was found much shorter than the right, turned outward, and as he stood on crutches he could not, without making special effort, touch the floor with his toes. On placing him upon a table it was not difficult to make out that there was an intracapsular fracture of the femur. There were all the symptoms; the leg was turned outward, the trochanter was high,  $3\frac{1}{2}$  inches above Roser-Nélaton's line, and on making rotation it was readily perceived with the fingers on each trochanter that the radius of the circle was shorter than on the right side. On making traction it was easy to bring the thigh further down, and with the finger under the trochanter slight crepitation could be felt. The patient was unable to stand on this limb, and as he was comparatively young, and had fallen perpendicularly upon his feet, showing that, if the rule were followed, the fracture was intracapsular, it was decided to operate.

Mechanical and expectant treatment was deemed inexpedient on account of the poverty of the patient. Which one of two procedures should be adopted was to be decided after opening the hip joint. If it were found that the head was probably still able to produce enough new bone, that means if it should bleed when scraped, it was intended to bring the two fragments together, and this was done; but had the head not bled when freshened the neck would have been resected and brought into the acetabulum. The operation was per-



formed on December 3, 1892, the hip joint being opened by the ordinary Langenbeck incision. The two fragments were found held together by loose connective tissue, and when this was cut away the interesting condition was observed that the fracture had taken place just at the base of the head, so that the smooth head was still perfectly movable in the acetabulum. The neck was atrophied and, as it appeared, put on the shaft in a slightly smaller angle, but otherwise it was in perfect condition. The annoying feature of the operation was that while the fractured surface of the head showed a concavity, the other side did not show a corresponding convexity, but also a concavity. After having removed the adhering tissue the head was scraped until its entire surface bled. The neck end was shaped with the chisel to correspond to the concavity of the head, having first stripped back the periosteum. The fragments were now fastened together by two long nails, such as have been recommended by Wyeth in resections of the knee joint.

The bone was soft, and the nails were inserted with perfect ease, but on removing the handle the first nail broke just at the surface of the bone, so that it held the fragments in apposition. The second one also broke, not at the surface, but inside the bone, and it was necessary to chisel out a piece of the bone to get at the broken end. This is mentioned because of its bearing on the after-history. The wound was partly closed with stitches, a gauze drain was introduced, and an extension splint applied to which fifteen pounds weight was attached. The next day it became evident that during the night a parenchymatous hæmorrhage had taken place from the porous bone; the pulse was 130 and the patient was very restless. Besides proper stimulation, hypodermoclysis of 800 ccm. of salt solution was at once made into the abdomen, but as a few hours afterward the patient's condition had not improved, intravenous transfusion of one quart of physiological salt solution was made. After this the heart began to beat better, the patient rallied and went on to complete recovery. He was in bed with splints full ten weeks, traction being made eight weeks. When he first got up to walk he used crutches; now he uses one cane. The shortening before the operation was three inches and a quarter; now it is an inch and a half. Perfect bony union has apparently taken place between the fragments. The movements are only slightly restricted, but otherwise normal. The limb having been out of use for ten months before the operation, there was of course considerable muscular atrophy.

Dr. LANGE remarked that the functional result in this case was certainly very good, although he did not consider that proved that osseous union of the neck had taken place. Indeed, he might say that he was inclined to think osseous union was not perfect, but that there was reliable fibrous union holding the fragments in good apposition. He thought one could feel on traction a certain amount of yielding of the neck of the femur. Then, too, the amount of shortening still present was too great to be accounted for in any other way than by assuming that there was a certain distance between the two fragments. Dr. Lange had under observation a young lady, twenty-one years of age, who received a fracture of the neck of the femur twelve years ago. In her case there had been gradual increase in the shortening of the limb. The shaft of the femur was freely movable on the os ilium, but the function of the leg was so good that she walked without a noticeably high shoe and danced, but to walk long distances tired her. She was so clever in elevating the other side of the pelvis in walking, and thus preventing exaggerated lameness, that one would not suppose she was laboring under so great mechanical difficulties. The result in Dr. Meyer's case certainly justified the procedure to which he resorted.

Dr. MEYER thought the amount of shortening could be accounted for by the amount of bone which he had been compelled to remove from the fragments when uniting them, and by the slight change of the axis of the fragments which had been made necessary in order to secure close approximation; also, perhaps, by the changed angle between neck and shaft. Thus far he had looked upon the case, and did look at it yet, as one of osseous union.

STRANGULATED GANGRENOUS LITRE'S HERNIA; LAP-  
AROTOMY; LONGITUDINAL ENTERORRHAPHY;  
RECOVERY.

Dr. MEYER presented a woman, sixty-nine years of age, who was brought to the hospital late in the evening of the fifth of February, having been sent there for incarcerated hernia which had existed for six days, the physician sending her remarking that perhaps immediate operation might still save her life. When first seen she was lying in bed, and her appearance was not that of one having strangulated hernia of six days' duration. On being questioned, she

said that she had not passed gas the first five days, but on the trip to the hospital she had passed much gas. The abdomen was not especially painful, but in the right groin there was a swelling looking like a femoral omental hernia, its pedicle apparently extending up into the abdomen. It was doubtful whether this was really omentum, and the condition was explained by supposing that there had been an inflammatory condition in the hernial sac, and that perhaps there was a pro-peritoneal fatty growth, but not strangulated hernia. The patient having passed a large amount of gas, an operation was not undertaken. The patient was not seen again for a few days. She had had, with the help of an enema, a movement every day, had passed gas and had taken food quite well. Still, on the fifth day after her entrance into the hospital she complained of some more pain, and as the temperature showed a slight rise it was decided to operate.

The operation was performed on the 11th of February. A longitudinal incision was made, cutting down on a pro-peritoneal, fatty growth, when an odor of gangrene was noticed. The sac, which seemed to be very small, could not be entered. Perforation of the gut was not evident. Being unable to get at a proper diagnosis from this side, laparotomy was done at a higher point. The gut at this point was normal. After putting in flat sponges and gauze the region of the hernia was opened up, and it was found that the edge of a small knuckle of intestine had been strangulated and become gangrenous. The mesentery was still in the abdominal cavity, and only the convexity of the coil had been incarcerated. It was a true Littre's hernia. Lifting up the knuckle and finding it gangrenous, the operation described by Dr. Abbe last year was decided on. That is, the slough was surrounded by a longitudinal incision, then the incision was lengthened parallel with the long axis of the cut, forming a longitudinal wound. The two ends were then turned to each other in the shape of an elbow and fastened together with a double row of sutures. The abdominal wound was left open. Healing went along nicely; no liquid ever escaped, the patient soon passed gas and had movements of the bowel. She is now perfectly well.

Dr. Meyer then showed a specimen from a similar but less fortunate case. The patient had a faecal fistula for a long time after an operation for, as far as he could make out, a gangrenous Littre's hernia of the sigmoid flexure. As the fistula would not heal, lap-

arotomy was performed. The fistulous gut was lifted out of its bed and the operation which has just been described was performed. The abdominal wound was partly closed with silk and partly with silkworm gut for secondary sutures. The silk was evidently not thoroughly aseptic, for where the silk sutures passed through the abdominal walls suppuration set in, and the patient died of peritonitis on the third day. Where silkworm gut had been used no suppuration had taken place. The specimen shows the manner of incision and the folds formed within the cut. The so often observed repetition of similar cases within a short period was shown by another case of gangrenous Littre's hernia entering the hospital soon after the patient just presented.

Dr. ABBE said he thought this method of operating applicable to such cases as the speaker had described, and also to those like the one in which he had applied it, a knuckle of the gut being caught under the ring and gangrene having taken place about three-quarters of an inch along the transverse axis of the gut. In that instance he cut through the gangrenous portion by an incision on each side of it extending above and below a distance of about an inch and a half, then brought the two edges together, getting immediate restoration. He considers that this method would be available in many cases where resection would be too severe an operation.

#### NEPHRECTOMY WITH RESECTION OF TWO RIBS.

Dr. LANGE presented a woman from whom he had removed the left kidney, the specimen having been presented at a previous meeting, to show the incision he had found suitable for this individual case. As in many women, the lower portion of the thorax was narrow and the last rib directed almost directly downward. The kidney was considerably enlarged in an upward direction under the diaphragm. To get sufficient access he added a cross incision to the usual lumbar incision at its upper point. This allowed of excision of the last two ribs, and widened considerably the lower aperture of the thorax.

He thought that dogmatic rules about which incision should be chosen should not be laid down. The size, and especially the position of the organ, also the nature of the disease, made one or the other incision more preferable for the given case. It should be the rule to make everything as accessible as possible, and to work as little as possible in uncertainty and darkness.

In the present case the wound had been freely contaminated with pus during the operation. It was left entirely open and tamponaded. With secondary suture recovery took place in a comparatively short time.

#### NEPHRECTOMY FOR ADENO-CARCINOMA OF LEFT KIDNEY; RECOVERY.

Dr. LANGE also presented a man, thirty-nine years of age, healthy and robust up to August, 1892, when he commenced to suffer from attacks of pain in the left loin, the pain radiating toward the region of the pubes. In the beginning of December he commenced to pass bloody urine, and frequently lost blood in large quantities. Says he lost 22 pounds within two months. When he came under observation in the beginning of February, no tumor could be detected. The cystoscope revealed the escape of blood from the left ureter, while from the right side clear urine escaped. There was some dulness over the lower part of the left thorax, but it remained uncertain whether that was due to enlarged spleen. No elements of tumor were found in the urine.

On February 9 nephrectomy was performed. The tumor had taken its origin from the upper pole of the kidney, and had grown upward under the diaphragm. In spite of removal of the last rib its enucleation was very difficult and tedious, because it was necessary to work under the diaphragm through a comparatively narrow pass. Many tight adhesions existed, and the plan to remove the organ, including its thick capsule, had to be given up. The capsule had to be opened, and the mass enucleated as rapidly as possible. A large portion of the already loosened capsule was then removed. After-treatment with gauze tamponade. Secondary suture and undisturbed convalescence. The hæmorrhages with the urine have ceased and the patient has gained a good deal since the operation. The chances for permanent recovery are, of course, not hopeful, owing to the nature of the growth. The tumor was about the size of a small child's head, and rather soft, succulent, and abundantly supplied with blood. It occupied the upper third of the renal substance, with small remnants of kidney tissue scattered within its mass. In several places a softening process had evidently taken place, giving rise to cyst-like spaces.

Microscopical examination shows epithelial elements in tubular arrangement. The observation made by others that an adenomatous character is peculiar to cancerous tumors of the kidney seems also to hold for this case.

#### PYLORECTOMY FOR CARCINOMA; RECOVERY.

Dr. LANGE then presented a third patient, a woman, forty-two years of age, who had lost one sister from cancer of the stomach, and who, after rapidly failing in health for some months, developed symptoms of pyloric stenosis. On examination a large tumor could be felt in the region of the pylorus; the stomach was dilated and dislocated downward. On March 1 last laparotomy was done with the view of doing gastroenterostomy. It was found that the tumor was large but movable, and could be detached from the mesocolon. Resection was, therefore, performed, and a large portion of the stomach was removed. The cut through the stomach had to be narrowed to about one-third of its size to make it correspond to the size of the duodenum. Internal mucosa suture with catgut; two external rows of suture with fine silk; iodoform tampon.

The patient made an uninterrupted and smooth recovery, and has gained considerably in weight, health and appearance, and does not have the slightest digestive trouble. The final outlook is, of course, not hopeful, and the disease will most likely recur. Still, the patient is apt to live longer than after a gastroenterostomy.

#### PYLOROPLASTY FOR CICATRICAL CONTRACTION OF THE PYLORUS; RECOVERY.

Dr. LANGE also presented a man, forty-two years of age, who first experienced pain in the stomach and at times in his back about three years ago. It came on periodically and was sometimes very severe. The intervals were sometimes several weeks long. In spite of various methods of treatment no lasting relief was secured, and the patient gradually became weaker and lost flesh. He was reduced from 155 to 105 pounds. During the attacks of pain he frequently had spells of nausea and vomiting, and sleep was so much disturbed that night after night he paced up and down in his room.

This continued for about two and a half years. He finally con-



sulted Dr. Linsmore, who called in Dr. Eischorn, and the conclusion was reached that stenosis of the stomach existed. The history, the presence of hydrochloric acid in excess, the absence of a noticeable tumor, pointed to its benign nature. On February 22 pyloroplasty was performed. The operation was tedious on account of adhesions and the fixation of the pylorus against the vertebral column. The scar tissue was so hard and thick that the needle could be passed through only with difficulty.

The patient made an excellent recovery, and has gained in weight. His digestive trouble has promptly disappeared since the operation, and any kind of food is well digested. Several times colicky pains have set in, which Dr. Eischorn thought might be due to the excess of acid, and which have disappeared since he was put on alkalines.

This is the third case in which Dr. Lange has done pyloroplasty for benign stricture in the pylorus or duodenum. All have ended in recovery, and the results have been very prompt and satisfactory.

#### RELIEF OF OESOPHAGEAL STRICTURE BY A "STRING SAW."

Dr. ROBERT ABBE presented a young woman on whom he had operated four months ago for impermeable stricture of the oesophagus. For the history of this case, and the method of operating adopted in it, see *ANNALS OF SURGERY*, April, 1893, p. 489. Dr. Abbe's object in presenting the patient was to show that the stricture had remained patent, there having been no perceptible degree of recontraction. The same sized bougie passed which was employed at the time of the previous report. Solid food, as well as liquid, was swallowed without difficulty. The patient continued to pass a bougie every other day, to avoid the possibility of recontraction taking place.

Dr. LANGE, in discussing Dr. Abbe's case, said that a somewhat analogous case came under his observation in which he cut the stricture from below by a graded series of small blades made especially for the case. So far as the tendency to recontraction is concerned, the act of deglutition, especially the swallowing of solid food, must do something to prevent it. His case occurred in a child two years of age, which had swallowed some lye and burnt the oesophagus extensively, causing much contraction. Since the operation one can still

feel some portion of the stricture, yet there is no tendency to recontraction, the operation having been done three or four years ago. A bougie is passed every one or two months. The child is well able to swallow solid food. It may be, however, that the injured part will not grow with the growth of the child, which would result in some seeming relative contraction of this part. Dr. Sands once reported a case which illustrated this peculiar lack of tendency to recontraction after operation.

### SALIVARY CALCULI.

Dr. JOHN A. WYETH showed several calculi removed from Steno's duct, four or five being the size of buckshot, two or three somewhat larger. They were removed from the right side in a girl of four or five years, who had been supposed to have lymphangiectasis, for which she had been submitted to two or three operations. When he cut into the tumor the calculi were felt, and after they were removed the girl made a complete recovery. It is now about nine months since the operation, and the saliva flows on that side normally.

Dr. A. G. GERSTER was reminded by Dr. Wyeth's case of calculi of the parotid gland of one of calculus of the Whartonian duct operated upon by him last summer. There was fever attending a swelling in the submaxillary region on one side, the soft tissues at the floor of the mouth being considerably swollen, the tongue protruding, saliva escaping from the angles of the mouth. A certain portion of the swelling corresponding to the submaxillary gland was very tender on pressure. The patient was anæsthetized, an incision was made down on the gland, when a quantity of turbid serum, resembling pus, escaped from the organ. The irritation and fever subsided after this operation, but the wound would not heal, and the patient continued to complain of pain at the bottom of the wound. Several weeks after the first incision had been made, Dr. Lilienthal, his assistant, felt, on examination through the oral cavity, a hard mass in the Whartonian duct under the oral mucous membrane. An incision was made upon this, and a calculus about the size of a pea was extracted. The wounds then healed promptly. In this instance the calculus had not only obstructed the flow from the submaxillary gland, but had set up inflammatory swelling as well, with fever and pain.



## TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

*Stated Meeting, April 26, 1893.*

ARPAD G. GERSTER, M.D., President, in the Chair.

### ANCHYLOSIS OF THE TEMPORO-MAXILLARY ARTICULATION.

DR. A. J. McCOSH presented a woman, twenty-six years of age, with the following history :

Four and a half years ago the patient was attacked by fever and lumbar pain, followed by a series of large abscesses in each lumbar region. One abscess followed another, and repeated incisions and scrapings were done. The patient was confined to bed for eighteen months, when all sinuses healed, and for the last year her general health has been good. During the period of the abscess formation she complained of great pain in front of her ears, and soreness and stiffness on manipulation of the lower jaw. Her trouble at the time was thought to be due to Potts' disease of the spine, but possibly it was due to sepsis following a four-months' miscarriage.

The pain in the temporo-maxillary articulation persisted for some months, and the stiffness increased until, at the end of a year from the commencement of these symptoms, the teeth of the lower jaw were firmly fixed upon those of the upper jaw, and no movements could be made. When seen by Dr. McCosh, three months ago, the teeth were firmly fastened against each other, the slightest separation being impossible. For a year the patient had subsisted on soft or fluid food, introduced into the mouth through a gap caused by the extraction of two incisor teeth.

In January, 1893, the patient was given an anæsthetic, and an attempt made to separate the jaws. With the aid of Koenig's buccal dilator it was found impossible to wedge apart the teeth sufficiently even to allow the finger nail to be introduced between them. No bands could be felt in the mouth, and no constrictions in any of the soft parts. The ankylosis was evidently in the joint.

Accordingly, the neck of the condyloid process of the inferior maxilla being exposed by a transverse incision along the lower border of the zygoma from a point anterior to the base of the tragus, and extending toward the median line for about one and one-quarter inches, a second incision, at right angles to this, was made downward from its middle point. This latter incision extended through the skin only, so as to avoid injury to branches of the facial nerve. The transverse incision was then deepened until the condyloid process of the inferior maxilla, just below its head, was exposed. It was then found that there was complete bony ankylosis in the temporo-maxillary articulation and between the head of the bone and the lower surface of the zygoma. There was considerable new bony formation about the joint, and it was impossible to estimate where the neck of the condyle joined the head. The condyle, neck and inner surface of the zygoma seemed to be welded together into a solid bony mass. The condyloid process was divided with a chisel just below the condyle, and again at a point two-thirds of an inch below, and the intervening portion of bone, a little over one-half inch in length, removed. The coronoid process was then found to be adherent to the zygoma. This was chiseled through. The same procedure was done on the other side, and the teeth, with the aid of a dilator, could now be widely separated.

The hæmorrhage was free, but was controlled by pressure. The wounds were sutured without drainage. Primary union resulted. On the sixth day the patient could chew solid food. She has been faithful in preventing any recontraction, and she can now, three and a half months after the operation, open her mouth widely. There is no pain or stiffness, and no tendency to recontraction. There has been no injury to the facial nerve or to Steno's duct, and the scars are so slight that really no disfigurement has resulted.

DR. MCBURNEY thought there were a great many cases of ankylosis of the lower jaw which go unassisted when really they could be enormously benefited by operation.

The management of the case must depend to a great extent upon the length of time the ankylosis has existed. Not, of course, upon the amount of ankylosis, for that may become complete in a very short time, but upon the amount of muscular atrophy or contraction which may vary according to the length of time the ankylosis has existed. He judged that in Dr. McCosh's case the temporal muscles still remained functioning. That fact would contribute very much to the success of the operation.

He recently had a case illustrating a different stage of ankylosis, the ankylosis having been present twelve to fourteen years, due to disease, probably tubercular, which had occurred in childhood. Owing to so early arrest of development of the lower jaw and its muscles, the patient's chin looked like that of an Aztec. He had operated three weeks previously, intending at first to do the operation practiced in this case by Dr. McCosh, but the atrophy of the temporal muscles was such that it was impossible to get even a finger nail between the teeth. It was necessary to cut away the coronoid process on both sides, together with the head and neck of the lower jaw, after which the result obtained was very satisfactory. The mouth can now be opened an inch and a half.

The operation can be performed by making a vertical instead of a horizontal incision, and the resulting scar is much less.

#### FIBROMA OF THE RECTUM.

Dr. McCOSH presented a man, thirty-four years of age, with the following history: For some years previous to last summer the patient had experienced discomfort in his rectum, and a gradually increasing difficulty in evacuation of his bowels. He had noticed that latterly the only faecal material which he had been able to pass was thin and ribbon-like.

He came to the Presbyterian Hospital last July, stating that he had not had a proper movement of the bowels for many weeks, and that nothing but gas and a little liquid faeces had passed for twelve or fourteen days.

On examination of the rectum a hard tumor was found in its posterior wall, extending up from just above the anus to the hollow of the sacrum. At a point three inches above the anus the calibre of the rectum was so blocked as to allow merely the end of the little finger to pass. The mucous membrane was smooth, but seemed adherent to the tumor, which was smooth and regular on its surface, and very hard. It was thought probable that the growth was malignant in character.

The rectum and ascending colon were found filled up with large, hard faecal masses which could not pass down. After endeavors for two or three days to soften these masses and cause their expulsion by laxatives and enemas, it was found impossible to empty the bowel, and, therefore, a left inguinal colotomy was done, and in the course of a week or ten days the rectum and colon were thoroughly

emptied by means of injections and irrigation, and breaking up of the masses under ether.

On July 10 the radical operation was done. An incision was made from the posterior border of the anus up to the lower end of the sacrum, the coccyx being removed. A glistening, hard, smooth tumor, adherent to the posterior surface of the rectum, was quickly exposed. It extended upward to the middle of the sacrum and down to within an inch of the anus. It was easily shelled out on its posterior and lateral surfaces, but anteriorly it was found intimately connected with the mucous membrane of the lower three inches of the rectum, and in dissecting it off the rectum was opened for a length of two and a half inches. The tumor was the size and very much the shape of a large cocoanut, and was declared by Dr. Thacher to be a fibro-myoma, springing from the muscular coat of the rectum.

The rent in the posterior rectal wall was sutured, and the sphincter ani muscle cut through and left unsutured. The skin wound was closed. It was the intention to suture the cut sphincter at a later period. Six weeks later the colotomy wound was closed.

#### THE TREATMENT OF GENERAL SEPTIC PERITONITIS DUE TO APPENDICITIS.

Dr. CHARLES MCBURNEY presented a case in which recovery from a general septic peritonitis had been secured by abdominal incision, copious irrigation of the peritoneal cavity, and subsequent drainage.

Dr. FRED. KAMMERER said he thought Dr. McBurney had been very fortunate with his case of general septic peritonitis following appendicitis. He had operated five times for general peritonitis and had not been able to ultimately save any of his cases, although one lived for five weeks after the operation. It is true he did not follow out the plan practiced by Dr. McBurney of washing out the general peritoneal cavity. Besides, at least two of his were distinctly cases in which large abscesses had formed about the perforated appendix, which had ruptured into the general peritoneal cavity, flooding it with a large amount of septic material. All were operated on when almost in a moribund state. It struck him as a noteworthy fact that Dr. McBurney's patient showed such slight symptoms of general sepsis when the abdomen was so full of foul fluid. The case is once more a reminder of the vast difference, pathological and clinical, that

exists between different cases of peritonitis, and of the difficulty in drawing general conclusions from a single case, to which Dr. McBurney has referred. On the whole, he thinks that the adhesive form of peritonitis is not adapted for treatment by washing out. Where there are no adhesions, and where there is, therefore, distinctly a general peritonitis, it may do some good, although it is questionable whether simple incision and drainage would not have been equally efficacious. He had mentioned such a case, in which he succeeded in keeping the patient alive for five weeks. It was distinctly a general septic peritonitis, with scarcely any adhesions and with symptoms of systemic intoxication. He simply opened the abdomen and drained without washing it. The temperature, which before the operation was 104°, sank immediately to 98° F., and remained low for two weeks, but then the trouble began. Adhesions formed among some of the intestines, leaving, no doubt, other parts in which pyogenic germs were still active, and, as it were, splitting up between them the general peritonitis into several isolated foci of infection. He operated five times upon the patient, opening abscesses in different parts of the abdomen, but after five weeks she succumbed to sepsis arising from an abscess which he had not been able to find. This shows, on the other hand, what a difficult thing it is to drain the general peritoneal cavity, even in a case like that of Dr. McBurney's, in which there were no adhesions at first.

Dr. CHAS. K. BRIDGON said he considered that Dr. McBurney's case will serve to make clear some of the unwritten pathology of appendicitis, which is as yet in its infancy. His first case represents in a pronounced manner one of those which have been spoken of as fulminating and rapidly fatal, and in which the termination in recovery could only be attributed to the prompt institution of radical measures and the perfection of the technique. His second illustrated another phase of the disease, not accompanied by the same profound intoxication, and relieved at once by prompt incision.

He had thought that the condition of general sepsis in some of these cases was modified by the condition of the peritonæum; in some where the surface of the serosa was covered by lymph it appeared to have lost its function as an absorbing surface, and the general toxic symptoms were only moderate, while in others, where this condition did not exist, but where there was a quantity of more or less offensive pus, the general condition was extremely bad.

During the last six months he had operated upon fifteen cases of

appendicitis in the Presbyterian Hospital without a fatal result. In four of these cases on opening the peritonæum there was a small discharge of sero-purulent fluid that was not walled in by any conservative process, and that apparently had no direct communication with the small pus foci in the immediate vicinity of the more or less disorganized appendix, and which were shut off from the general cavity. These free collections were small in amount and limited to the loin. In operating on such cases he thought there was danger, in flushing the general cavity, of converting a local into a general infection of the serosa. Thorough sponging and iodoform tamponade have carried his cases to a successful issue. Of course, where there is a diffuse general suppurative peritonitis, the use of thorough flushing, such as was used in Dr. McBurney's first case, is the only measure to be relied on. He regards drainage by gauze as more efficient than that by tubes, and where it has been found necessary to make two long lateral incisions he has adopted the plan of passing a wide tampon through both.

Dr. GERSTER said that notwithstanding the great amount of material which has been accumulated on appendicitis, and the numerous theories advanced regarding the many features of the disease, he did not believe the essential part of the pathology is yet known. Not that he opposes the view that the process usually arises from the appendix. To illustrate his meaning, we may open the abdomen in two cases and find apparently the same condition in each, yet the course of events be very different. We may find a diseased and perforated appendix surrounded by pus which is not limited, so that there is really free communication between the focus and the peritoneal cavity. There is more or less general peritonitis, yet one case will recover and the other die, although both are treated in the same way, and both manifest before the operation the same amount of septic infection. The gross appearances do not give us sufficient explanation of the different courses of the malady under identical conditions.

Referring to another complex of symptoms, he said that he had opened the peritoneal cavity, within which a partially gangrenous appendix was located, surrounded by pus which was completely shut off from the rest of the peritoneal cavity by good adhesions. The patient exhibited intense septic symptoms, somnolence, a deep depression of the nervous system, vomiting, but especially that somnolence which he found very ominous in appendicitis. The appendix was completely removed, the cavity cleansed thoroughly and drained;



the rest of the peritoneal cavity was found to be free ; yet after this very thorough operation the patient's condition did not improve at all, the stupor and high temperature, etc., continued, and death took place from the continuously increasing very acute septicæmia. This case occurred last year. He had had an identical case three weeks before, and it is somewhat remarkable that both of them came from the same colleague, who also noticed their curious parallelism. Yet in this second case, while finding the same conditions as in the first, and resorting to the same treatment, the result was very different, for the patient's condition improved, and continued to improve, until recovery was beyond reasonable doubt.

There are other cases of appendicitis in which the communication between the effusion in the vicinity of the appendix and the peritoneal cavity is a free one ; where we find what is actually pus, and what anybody and everybody would declare to be pus, filling the pelvis, quantities of it escaping as soon as the peritonæum is incised. Yet, notwithstanding this serious state of things, as soon as we dip out this turbid matter and introduce gauze drainage the patient improves and finally recovers. Again, cases apparently identical with this, treated in the same manner, still go on from bad to worse, and end fatally. A post-mortem examination has been made in a number of these cases and disseminated abscesses were found in the peritoneal cavity which had not existed at the time of the operation, for the entire cavity had been searched carefully, and they could not have been missed had they existed. Such abscess may form after operations, and we have no control over them. Where infection of the peritonæum has occurred they will form. Not that all such collections of exudate must lead to a fatal issue. Where its character is mild it may be absorbed, and those who oppose an operation for appendicitis have probably met with cases of that kind which have recovered. Undoubtedly, however, they would have recovered more promptly with an operation than without. There must be a regular gradation of cases from the milder to the severer forms, and while some may recover without an operation, there are others which can be saved only by the knife, while still others die despite of all that can be done. When the entire peritoneal sac once becomes thoroughly infected no amount of flushing can cleanse it, and the patient will surely die. Dr. Gerster had seen that repeatedly, although he had been anxious to demonstrate that the cases reported, notably by Dr. Abbe, of general purulent peritonitis cured by thorough washing

and drainage of the peritoneal cavity, could be duplicated, but had failed. He had tried the method honestly and thoroughly. The cases were bad ones, of course—cases of multiple abscesses with stinking pus. He turned out the pus collections, broke down the adhesions, washed out the abdomen, drained in both loins, both inguinal regions and through a median incision, but the patients died exactly as if they had not been operated upon.

One more fact should be mentioned while we are discussing this very important subject, one which needs a great deal more elucidation even than Dr. McBurney's wide experience has been able to throw upon it. Although a warm advocate of an early operation in appendicitis, yet he believes there are cases in which a stage has been reached where recovery can only take place by letting them alone. He had under observation two such cases in the last two months. One was in a boy of seventeen years who had had appendicitis nine days, and at that time indubitable peritonitis. His hue was that of saffron, his belly tight as a drum, there was vomiting of a greenish material, apparently due to paralysis of the intestine; the percussion sound was dull in both loins. By bimanual examination, one finger in the rectum, a fluctuating mass in the pelvis could be palpated. The pulse could hardly be counted; the body was covered with cold perspiration. In short, the boy was in such condition that he did not dare subject him even to the slight shock of etherization and opening the large abscess. The fact that no operation was performed through fear he might die during the procedure accounts for his being well to-day. Intensely fetid pus was soon evacuated through the rectum, perforation having taken place without the shock which an operation would have imposed, and the patient's condition began immediately to improve, and he recovered. The other case occurred in a man; the same conditions existed, and operation was not done through fear that the slightest shock might cause his death. Perforation took place into the rectum, a large quantity of pus was evacuated, after which the pulse, which had been thready, became fuller and slower, the temperature fell, the tympanites disappeared, and the man's general condition improved to a great extent. Five days later the patient could not pass his water and a rounded tumor was felt in the region of the bladder, the catheter bringing away only a small amount of urine. It then became apparent, on examination per rectum, that the tumor was a reaccumulation of pus, the spontaneous opening into the rectum having become occluded. An incision was therefore



made in the suprapubic region and an enormous abscess drained, and the patient recovered. Had the patient been subjected to anæsthesia and the shock of an operation when first seen he would have died in consequence of the procedure. In other words, both patients recovered because they were not operated upon.

Dr. MCBURNEY said with regard to the more intense septic condition of some of these patients as compared with others, he thought we should take into consideration the difference of susceptibility to sepsis by different persons. This he regards as a very important element in the cases. The pathological condition being the same in two patients, one will get well under operative treatment such as described, while the other will go on and die, even though his condition at the time of the operation seems somewhat better. We see the same thing in other diseases. For instance, some surgeons are liable to excessive poisoning from small points of infection on the fingers, while others seem entirely immune. He is strongly inclined to attribute considerable value to the difference of susceptibility to sepsis in cases of appendicitis. In one case the peritonæum may be full of a very nasty material and yet the patient be not wholly septic; in another case, the peritonæum being full of the same nasty material, the patient will be wholly septic, and between the two we have a vast number of grades. He has seen patients recover whose conditions were quite as bad as that pictured by the President, while on the other hand patients die of active appendicitis in whom the appendix had not even been perforated. The sepsis in one of these cases was in the mucous membrane of the appendix, but the patient had peritonitis, every portion of the peritoneal cavity being highly injected, although there was no effusion. In the case now in mind the appendix was removed, everything possible was done, but the patient, although he lived a week, showed no signs of improvement and died of sepsis. Such a case shows excessive susceptibility.

Therefore he would not hold up such cases of recovery as he had spoken of as illustrating in any sense the value of that particular method of treatment, as applied to cases presenting that particular pathological condition. He was fortunate in having two cases where the sepsis was down in the cavity and had not very thoroughly entered the vessels. It should warn one not to be too confident of methods. He will have cases which will defeat his methods, whatever they may be, and there is an explanation beyond the mere gross pathological condition.

He wished to refer to the question of drainage brought up by Dr. Briddon, for it is an important one. The Doctor said he did not use tubes, but always gauze. There is a rule which covers the question of method of draining to a certain extent. He very seldom uses tubes where he can wipe out or wash out, cleaning out the cavity which can afterward be packed with gauze and where the presumption is that the fluid effused will not be greater than the gauze can absorb in its meshes and hold until it is changed. Where, however, a large quantity of fluid has been thrown into the peritoneal cavity, and a very considerable quantity of it does not come out, it will find its way into the pelvis in such quantities that gauze will not be sufficient to absorb all of it. It is not the fluid produced by disease or a moderate effusion which slowly accumulates, but a considerable quantity which the surgeon himself has put in. In such cases he would introduce a double drainage tube, and remove it as soon as that extra quantity of fluid has been got rid of.

Dr. BRIDDON hoped that the general profession would not infer from Dr. Gerster's cases that they would not have been better off had the surgeon been called earlier and performed an operation before rectal perforation was about ready to take place. Although these two patients recovered, it was by no means certain that intestinal obstructions or other trouble might not result from a condition which had been allowed to go on until they had almost reached a moribund state, and were only saved by the abscess breaking into the gut. Although he had been for many years on the fence, he had now come to regard every case of appendicitis as calling for an operation.

Dr. GERSTER said he did not sanction at all waiting eleven or twelve days when there was an effusion which could easily be diagnosed. The only point was that certain cases were seen by the surgeon for the first time, when to operate would almost surely end in the patient's death, and in such cases he opposed interference. In some, like the two mentioned, perforation might take place spontaneously in time to save life.

## EDITORIAL ARTICLES.

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### CHIPAULT ON THE SURGERY OF THE SPINE AND SPINAL CORD.<sup>1</sup>

THIS article is a continuation of the one which appeared in the same periodical in August, 1892, and which formed the basis of an editorial digest in the ANNALS OF SURGERY, December, 1892.

In performing laminectomy for the relief of traumatic lesions it is not now considered sufficient for the operator to content himself simply with the removal of a greater or lesser number of arches, but in order to make the procedure complete it is essential that the dura mater should be opened and the intra-dural and medullary lesions treated. By this means the value of the operation has been enhanced. Out of 160 cases analyzed by Chipault, 20 were cured, 33 were improved, 22 gave no improvement, and there were 65 deaths and 15 unknown results.

This proportion of successes to deaths is decidedly discouraging. The deaths were all due, however, with the exception of two cervical cases that died from operative hæmorrhage, to one of the three following causes :

(1) The extreme gravity of the traumatism, the injury soon affecting the respiratory centre, or else there were lesions of other organs also present.

(2) Infection through the operative wound, which was so grave and so frequent an accident in pre-antiseptic days.

(3) Infection through the lungs, bladder or bed sores consequent upon the injury of the spinal cord.

The first class are naturally beyond surgical assistance, the second should not be considered at the present time, while the third can be controlled somewhat by antisepsis of the bladder and the ulcerations.

<sup>1</sup> Revue de Chirurgie, March, 1893.

When a traumatism involves only the cauda equina the operation must be performed below the first lumbar vertebra, the cord ending at this level in adults, when the head and trunk are flexed. There have been many successful operations for fractures below the level of the twelfth dorsal vertebra. In delayed operations less perfect but satisfactory results have been obtained even at times after incomplete intervention.

In some cases where the condition had remained stationary for months, or even years, an ordinary amount of motion and sensation has been regained after operation. The therapeutic result in these cases required weeks before it became evident, and months before it reached completion.

The nerves of the cauda equina, like those of the periphery, are decidedly resistant to traumatisms. Whether compressed or divided, they recover as soon as the compression is removed, or the severed ends united. Even when the operation is delayed for a long time complete recovery should result from thorough surgical interference, unless there is secondary degeneration of the cord, or unless instead of the nerves, which recover so well, the canal is occupied by ganglions which do not recover.

A study of the cases of injury in this region leads to the conclusions that where there is lumbar or sacral fracture, with permanent and irreducible bony displacement, operation should be done at once. Where the fracture has been replaced spontaneously, or by surgical means, wait; if the indications point toward recovery, let it alone; if there is no change of any kind, operate about the end of the first month, not sooner, because there will be no functional recovery earlier than this, and no further delay should be allowed, lest incurable medullary degeneration set in.

In the operations for fractures involving the cord the results have been uncertain and usually unsuccessful. The majority survived the operation, but were not benefited, and died of exhaustion or pyelonephritis. Some slight improvement has been noted in cases where the nerve roots arising from a segment above the injured one have

been involved, and have recovered their function after the removal of the compression. This has not been so frequently the case in the upper dorsal and cervical regions as it has in the lower dorsal. Besides these cases of nerve repair there is a small number where the improvement is not only due to the nerve repair, but to the cord also. A careful study of these cases in comparison with others less fortunate but more frequent help us to form conclusions in regard to the probability of success following operation in a given case. Consider then, first, fractures confined to the arches; second, transverse complete fractures, or fractures of both the body and the arches.

Tillaux considers that the former are the only ones offering any hope to the surgeon. They are favorable for interference because the compression is caused simply by the pressure of the fragments, and not, as in complete fractures, by the weight of a portion of the body that forces the upper segments of the spine down upon the displaced lower segment. Here the injury to the spinal cord is due simply to splinters, and there is no degeneration from compression or elongation of the spinal cord as is usually the result in fractures involving both arch and body. In this class of cases, too, only the posterior columns are usually wounded, and they seem better able to resist compression and even partial destruction than other parts of the cord.

Operation for these conditions should be undertaken early, for the fragments of the laminae cut into the cord at each contraction of the sacro-lumbar muscles.

Complete transverse fractures are very different from the preceding, and present a number of varieties, which must be distinguished in order to determine the indications and surgical methods of treatment:

(1) The most common variety is where there is a permanent bony compression between the body and the arch.

In a series of experimental fractures in twenty-four children and eight adults, where the cord was either badly contused or entirely severed, the bones were found in place, and constant bony replacement would be considered as the rule were it not for the hundreds of

cases on record where autopsies and operations have proven the existence of a permanent bony displacement.

It is possible that these differences of opinion may be explained by the supposition that these displacements are corrected spontaneously after death, when there has been no callus to fix the fragments. In general, however, it may be said that in complete transverse fractures there is during life always, or nearly always, a permanent bony compression.

Chedévergne says that the cord is cut by the sharp outer edge of the vertebra, as it is stretched across the fragment. This stretching is easy, because the cord is bound at different points by ligaments from the pia mater, and the cord soon loses most of its elasticity. Other authorities, however (Chipault, Félizet, Minard), do not consider the edge of the vertebra, no matter how sharp it may be, sufficient to cause the spinal compression. It really only compresses the meningeal sheath, which is free enough in the canal to allow of its being lifted a centimetre from the vertebra. Permanent bony compression is made then not by the body alone, but by a compression between the body and the arch. The failure of the operation of opening the spine in these cases, where theoretically it should be so successful, may be due to either of the following causes:

*Incomplete or too timid interference.* Most surgeons have been content to remove one or two arches and make only an exploratory operation, while to be successful not only the posterior but the anterior compressing factor should be reached. After freeing the sheath the edge of the projecting vertebra should be removed or the displacement reduced by direct measures; the dura mater should then be opened and the clots removed, and the adhesions which interfere with the free circulation both of the blood and the cephalo-rachidian fluid should be broken down. The severed nerve roots may then be reunited either to their own roots or to roots arising from spinal segments above the point of injury. Repair of the cord, if it is completely crushed or seriously injured, is impossible, because of the extent of the sclerosis and secondary degeneration that follow these injuries.



*Interference has been undertaken too late.* This is a frequent cause of failure. In two or three days after the injury myelitis sets in, and, perhaps, weeks later sclerosis. After the third or fourth month the cord tissue has been converted into a mass of cicatricial tissue.

If the conditions of the parts allow of an operation it should be undertaken early, after only a few days have elapsed, before the injured portion of the cord has been destroyed by the persistent interference with the circulation. In studying the cases of trephining for permanent compression of the cord between the body and the arch we see that delayed operations have never given satisfactory results, while the contrary is true in nearly all the early cases. Consequently, in future, early rather than late interference should be the rule. Where the operation has been delayed ten or twelve or more months the cord has been found completely sclerosed, reduced to a cicatricial band, and more or less stretched. In this case there is often very little improvement, not enough to really benefit the patient.

On the other hand very early operation shows, occasionally, considerable benefit, and even some complete recoveries. Improvement, when it comes, begins by the sudden and almost immediate return of sensibility. Motor repair is slower, but progressive from above down. Sometimes in operations in these early cases recovery of function has not been satisfactory.

Leaving out of consideration cases that are *in extremis* we can readily recognize two causes for the partial or total failure of the operation.

*The high position of the injury.*—Whatever may be the cause, operations in the cervical or cervico-dorsal regions have been very unsatisfactory. All the successes belong to the mid-dorsal, or to the region of the *conus medullaris*. The next cause of failure is *the severity of the injury*.

It is safe to conclude then that in cases of permanent compression between the body of the vertebra and the arch interference having given beneficial results, it should be performed

(1) Very early.

(2) When the traumatism has affected the lower and not the upper part of the cord.

(3) When the cord lesion has been simply a compression, and not a destruction of the cord.

The youth of the patients also affects the chances of obtaining a good result from delayed operation.

In cases of fracture where permanent bony compression was produced either by the edge of the vertebral body, or by the arch being either partially or completely pushed into the canal, or where the compression has been due to callus, it is plain that the first would offer but slight hope of recovery, the second would be better, and the third, being a slow rather than a sudden compression, would allow of comparatively late interference.

In cases where laminectomy is indicated it is superior to a simple reduction of the fragments. This is evident in fractures of the arches, reduction having no effect upon isolated fragments. This is plain, because reduction has been of benefit only in cases where laminectomy was also employed, fractures in the region of the cauda equina and low recent fractures, without any serious nervous lesion. Reduction is also only applicable to bony displacement. It is useless where there are clots or adhesions which, if they persist, are sufficient in themselves to account for the spinal disturbance, and which can only be discovered and treated by a laminectomy. Reduction has, even when most carefully performed, sometimes aggravated the lesion, and hastened death.

In some cases, however, where laminectomy is contra-indicated, reduction has given good results as, for instance, in cases of cervical luxation without fracture. In these cases, if recent, slow reduction has given much success, if old a rupture of the adhesions by the manipulations might be the beginning of recovery. This is not applicable to cases which are complicated by fractures which are still beyond every effort of the surgeon.

It is possible to still more improve the prognosis of reduction in



simple cervical luxations by making this reduction with the arches exposed, and employing a silver wire suture of the special processes to prevent the relapses which are sometimes sure. Hadra attempted this without success, but in his case the suture broke, and the wound suppurated.

*Fractures from Firearms.*—Fractures without penetration of the spinal canal by splinters, or by the ball, are much the most favorable for treatment, particularly where only the spinal processes are involved. At the present time the projectile could be removed at once, and the wound rendered surgically clean.

Exceptions to this, however, should be noted in the throat and neck, where almost always the trachea, pharynx or large vessels are wounded. Fractures of this kind show that *peri-* and *para-*medullary lesions may be favorable for recovery, but where the cord is involved the results are disastrous. Visceral complications also increase the gravity of the lesion.

In all these cases, where there is no opening of the canal, there may appear at the time of the injury, or just after it, some more or less serious complication due, perhaps, to hæmato-rachis, or, perhaps, to capillary hæmorrhage into the cord. These conditions scarcely aggravate the prognosis. But in cases where these symptoms occur months or years after the injury, due either to slow progress of the sclerosed lesion at the side of the cord or nerve roots, to ostitic lesions of the vertebræ, hyperostosis causing compression or sinking of a diseased vertebra, little benefit has been obtained from treatment.

In cases of penetration of the vertebral canal if there is simple and slight compression by a splinter, or by the projectile protruding into the canal without crossing it, and particularly if the traumatism is level with the *cauda equina*, and not in the cord itself, functional recovery is possible. Where, however, the projectile remains lodged in the canal the result is negative, and this is also true when it traverses the canal and penetrates the opposite wall. The cord in this latter case is crushed, perforated, or completely destroyed, perhaps for

a long distance if the ball after entering the canal has been deflected from its course, and operation in these cases can only prevent meningeal infection.

*Wounds of the Spine by Blunt, Cutting, or Pointed Instruments.—*

This class of injuries are rarer than the preceding varieties. The aim here should be to avoid meningeal infection, and to put the cord in the best condition for repair. The first indication is to close the meningeal opening in those exceptional cases where there is no lesion of the cord, but where a fistula has formed, allowing of the escape of cerebro-spinal fluid; the wound should always be rendered aseptic. It is more difficult to determine the procedure in cases where there is a fistula, not intra-medullary and without injury to the cord, but giving exit to pus which flows from a fragment of the weapon which has remained fixed in the spine.

In cases of section of the cord by a cutting instrument, an early and complete operation will lessen the mortality and give better functional results. Extraction of the foreign body if it has lodged in the wound, in any case to enlarge the wound, remove the splinters and arches, the intra- or extra-meningeal clots, and finally draw together the medullary wounds is essential to a proper recovery.

This done immediately after the injury, when the myelitis has not had time to change the condition of the separated surfaces, will, perhaps, allow of reunion by first intention.

Sgobbo says that repair of the cord is impeded only by the interposition between the two ends of a clot and then of a cicatrix; a rapid union would reduce these unfavorable conditions to the minimum and put these sections, whether complete or extended, that clinically could not recover in the same conditions as limited sections.

In old cases, or where traumatic myelitis and ascending and descending scleroses have affected the cord for any distance, any intervention is useless.

*Vertebral Tuberculosis.*—Spinal surgery of vertebral tuberculosis may be directed against bony lesions only, or against medullary complications.

Cases where the removal of a sequestrum or of diseased spinous processes at the base enables us to extirpate the whole disease are favorable when the operation is thorough. It may be necessary to follow granulations along the posterior face of the laminae; complete operation may be more difficult and the benefit less constant and lasting where one or several laminae, often with all or part of the articular processes, are also carious. In these cases the granulations may spread over the posterior surface of the dura mater and above and below under the healthy arches, forcing themselves in front and over the sides of the canal. It may often be that the vertebral bodies themselves are diseased. Exceptionally, the transverse processes may also be attacked.

In disease of the vertebral body, when confined to the lumbar region, Treves' method is applicable. When there is a lumbar abscess extending into the groin or thigh, the search for the diseased bony point is much simplified. Lumbar incision allows of direct treatment of the bony lesion without any trouble; if there is superficial caries, it may be scraped with a Volkmann's spoon, and if a sequestrum is present it can be grasped and removed with forceps, the bony fistula being enlarged, if necessary, with a gouge. If the abscess points in the lumbar region the opening should be made either where the abscess points, parallel to the last rib, for example, or better, by systematically following the external edge of the sacro-lumbar mass. The abscess pocket is then opened. But if there is an abscess pointing anteriorly or posteriorly where after ablation of the spine and scraping of the abscess walls it is still necessary to insert a drain to provide for future lavage, or where it is packed with iodoform gauze or simply dressed, recovery is very slow, the deep and tortuous cavity requiring weeks and months to close by granulation. During this time, of course, the patient is exposed to the dangers of suppurative changes, to secondary infection of the wound, and to visceral degeneration. Sometimes, too, a fistula requiring another operation results. Primary union may, however, be possible. Rigorous antiseptics and removal of diseased bone and fungous granulation tissue

is necessary to accomplish this result. Fistulæ and infected pockets and abscesses with many diverticuli cannot be treated in this way, but must heal by granulation. Drainage and tamponing should also be employed if the lumbar incision leads to fistulæ arising in the sacral or dorsal vertebræ, where necessarily the operation cannot be complete, but where, nevertheless, it may be very successful.

Only exceptionally are the dorsal bodies accessible after lumbar incision. In order to reach this portion of the spine a more direct method must be employed. It is probably only practicable to reach them surgically when an abscess points behind, passing back between two costal heads.

The anterior portion of the cervical vertebræ is less accessible than the dorsal; thus usually the treatment of cold retro-pharyngeal or retro-oesophageal abscesses is limited to their incision through the mouth or laterally through the neck. These operations, however, are dangerous, incomplete and insufficient, and should only be undertaken as a palliative measure.

No special interest attaches to the study of posterior disease of the sacrum, but tubercular foci, sequestra, or areas of carious disease in the anterior sacral region, which are accompanied with perineal fistulæ (sometimes gluteal, inguinal or subiliac), are more difficult to manage and seldom successful. Cases of this kind often complicated with sacro-iliac tuberculosis are as discouraging as possible.

The tortuous, multiple and irregular fistulæ and the peri-fistulous sclerosis, as well as the advanced age of the patient, are all especially unfavorable for successful treatment.

If the disease affects the sacro-coccygeal region it is possible to resect  $1\frac{1}{2}$  to 2 centimetres of the bone without entering the spinal canal.

Trelat says that "cold abscess being a tumor composed of a fibrous wall and variable contents, must be removed or opened and its walls scraped, making a simple wound and treating it antiseptically. Where the bones are carious it is necessary to go down upon the bony lesion and treat it according to the requirements of the case.

Diverticuli must not be forgotten, as these starting points of the abscess frequently cause relapse. If this occurs they should be treated in the same way as the first tumor." In the vertebræ more than elsewhere the application of this ideal method meets frequent obstacles—due to the extent or the seat of the lesion. In these serious cases it is rare to obtain the desired result at the outset. Here, as in many bony tuberculoses a second, even a third operation may be necessary.

Where compression occurs in Pott's disease the course to be pursued varies. Cases where the bony lesions are limited to the arches, the pachymeningitic lesions of the epidural and subjacent dural zones are very favorable for operation; ablation of the sequestra and of the diseased bony fragments is easy, the region of the posterior tubercular pachymeningitis is very readily scraped and even completely removed, since it does not adhere to the underlying dura mater, which remains smooth, white and with almost a healthy appearance. Careful and complete removal of the diseased parts permits of a radical operation.

The posterior position of osteo-meningitic lesions is, however, exceptional, more often the bony lesion is in the vertebral bodies, and compression of the cord is from before backward by a bony projection, or a perimeningitis.

Antero-posterior compression by a bony projection can be either slow or sudden, both being exceptional. The first has often been denied; however, many surgeons have discovered a transverse bony edge projecting into the canal, and flattening the cord, in cases where the paraplegia had developed gradually.

Sudden bony compression results from a true fracture by a traumatism often slight, acting on already diseased vertebræ.

The results of surgical treatment in cases where the bony compression has been sudden indicate that there is no value in operation.

In the cases of slow bony compression the results are very prompt, remarkable, but quickly complicated by proliferation of tubercular granulations into the perimeningeal tissue.

This proliferation is usually the beginning of the paraplegia, the only cause of the accident.

In these cases most surgeons are content to remove a greater or less number of arches, that is to say, to relieve the cord posteriorly, in the hope that its elasticity will enable it to escape from the pressure of the granulations which force it back.

If the peri-meningitis spreads along the sides of the laminae the tubercular products must be removed, but if it is found that the tuberculous tissue is apparently inaccessible, and spreads on the sides of the vertebral body between the nerve roots, and in contact with the articular processes which may or may not be carious, operation is useless. These cases require an operation which may at first appear to be successful, but which will finally lead to relapse. The granulations continue to proliferate, and compression of the cord first against the arches, and after their removal against the cicatrix, results. In spite of the unfortunate results reported in these cases the attempt has been made to attack this condition from the front.

Two methods have been proposed: one by dissecting around the spine; the other by trephining, pressing the cord to one side and treating the diseased body from the canal. These methods are difficult, and take for granted that the tuberculous lesion is not limited to posterior face of the vertebral bodies.

The method of operating usually adopted is to first lay bare the portion of the cord where the compression exists. This incision should be free enough to expose healthy tissue beyond the disease. The healthy tissue is covered by an adipose cushion through which the dura mater may be seen, stretched, elastic, bluish-white, and covered by several small longitudinal vessels, which are most abundant in the median line. The compressed portion of the cord is on the contrary completely deprived of normal adipose tissue, projects backward, is flattened and traversed by many vessels, which pulsate very slightly or not at all.

A sufficient number of arches should be removed to expose all these details, and to enable the operator to ascertain with the finger that there is no compression beyond.



The granulations can then be seen projecting between the nerve roots on one or both sides, forming a simple mass of tubercular tissue, or enclosing an abscess. In any case, by pushing the cord to one side and then to the other, and by lifting it from its bed the granulations may be extirpated; all the anterior peri-meningitis, so easily separable from the dura mater, may be removed, and the cavity in the vertebral body scraped out. Bony irregularities should be smoothed off, and all sequestra removed. This operation is easy since the space between the roots, large enough to allow of the passage of instruments along the side of the vertebral body in health, is still larger in Potts' disease. After thorough cleaning of the cavity it should be drained by a tube passing between the membranes and the canal to the lowest angle of the skin incision. Careful and repeated washings of the cavity must be continued. This is as indispensable as the curetting. After a time the drain may be replaced by a strip of iodoform gauze, allowing the wound to fill up little by little.

No matter how carefully the curetting is done, it is often incomplete; the granulations in front of the nerve roots are scarcely touched.

Certain contra-indications to operation must be taken into consideration.

(a) *The General Condition of the Patient.*—An advanced pulmonary tuberculosis or a sudden increase of the tubercular trouble, or a grave generalization in other viscera, contra-indicate operation here as in all other surgical tuberculosis.

(b) *Bony Lesions.*—When the bony lesions have extended to several vertebral bodies, encroaching backward on the articular processes and the laminæ, operation is not only useless but dangerous.

(c) *Medullary Lesions.*—The commonly successful results in medullary lesions after simple orthopædic treatment is a contra-indication to operation. Nearly always when the granulations disappear or when a cold abscess with compressing intraspinal diverticuli is opened, the paraplegic symptoms are overcome.

Most surgeons only operate when there is an old and grave com-

pression. "I only operate," says Kraske, "when there is vesical paralysis; this is such a severe symptom that it justifies everything." "One should only operate," say Bullard and Burrell, "when there is incontinence of fæces and of urine and complete motor-sensory paralysis below the compression—that is to say, when there is a progressive and sure progress toward a fatal termination."

Others, on the contrary, think that it would be useless to wait for accidents and possible grave extension for the proper time to operate, but either operate systematically in all cases or in a certain number only with a certain evolution; thus in a recent work M. Babinski, after having separated from the paraplegias of Potts' disease a group of paraplegias without lesions appreciable under the microscope, adds: "It must be admitted that among these patients the organic resistance of the cord is not unlimited, and it is proper to suppose that in time the compression would provoke a spinal lesion. On the other hand, it is rational to believe that overcoming this lesion would obtain the disappearance of the functional troubles which depend upon it. The operation appears to me, then, to have a double indication, for it can be considered as a preventive and a curative measure."

In paraplegia from compression due to anterior pachymeningitis the difficulty is to decide when to operate. If delayed too long, we may have an incurable spinal cord lesion and a very unfavorable general condition and extended bony disease, while if the operation is performed early, we may subject the patient to an operative manipulation when he would have recovered by other methods. Neither of these cases should be operated upon, but this method should be applied to the few that occupy the middle ground.

A special and urgent indication has been supposed to be present in the cases where there was pulmonary difficulty, due to the height of the lesion, but the results of operation in these cases is not encouraging, most of the patients having died very soon after the operation.

There remains to be tried as an adjuvant to other measures



Hadra's method of suturing the transverse processes. In medullary tubercle all surgical treatment is useless. It is in our opinion the same with tuberculosis of the pia mater, which develops usually in the form of granulations, extending for a greater or less distance from the dural lesion, and like those granulations that Schede found in the autopsy on one of his patients. Occasionally it develops in the form of a large localized tubercle. This last variety seems at the first glance to justify intervention, but if this is undertaken there is great risk of not being able to draw the membranes together again, and of causing a septic or tubercular meningeal infection, or a cerebro-spinal fistula.

Moreover, the intradural tubercle may not be at the same level as the peripachymeningitis.

Rarer still are tuberculous cerebro-spinal fistulæ, which require for their production three exceptional conditions: posterior Potts' disease, dural perforation, a cutaneous opening. Meningeal infection through this fistula may be possible; it is necessary, therefore, we believe, to make a large and prudent clearing out of the tubercular spaces, perhaps suture of the dura mater, after ablation of the diseased portion, but in all cases an active treatment is rendered indispensable by the gravity of the probable accidents. If this is impossible then attentive dressings and antiseptics of the tuberculous fistula should be carried out.

When a cold abscess ruptures into the œsophagus, the pleura, bronchi or intestine, while the prognosis is bad, and there is probably very little to be obtained from operation, still it should be attempted.

(3) *Tumors*.—Some surgeons have opened hydatid cysts, believing them to be cold abscesses of vertebral origin, others have excised the spinous processes or transverse processes in connection with a tumor, ordinarily fibroma or sarcoma, which they have extirpated. This is not truly the surgery of the spine, and does not concern us.

Without considering some cases of accidental opening of the spine, and spite of the purely theoretical advice of Cruveilhier, Leyden and Bramwell, there was no typical and regular operation for the

removal of a tumor before that of Bazy (October, 1887) and Gowers and Horsley (June, 1888).

This last gave the necessary impetus to this work, so that Chipault has been able to collect more than twenty operations for medullary or retro-medullary tumors compressing the cord. These facts, taken in conjunction with clinical observation, have permitted the determination of the precise cases where surgical intervention is indicated.

(a) *Intra-medullary Tumors*.—Ordinarily in these tumors the neoplastic element slowly substitutes itself for the nervous elements rather than compressing them mechanically. Their ablation would only then aggravate the symptoms.

Very exceptionally, the tumor is encapsulated, and escapes on simple incision.

The surgery of intra-medullary encapsulated tumors does not yet furnish us with sufficient facts for or against the operative treatment. This is also true of the puncture of intra-medullary liquid tumors, hydatid cysts, dermoid cysts, and abscess.

(b) *Extra-medullary Tumors*.—These tumors, much less rare than the preceding, may be of extra-spinal origin, spreading secondarily to the canal, of spinal or bony origin, of intra-spinal origin, and may be extra- or intra-dural.

(a) Certain of them absolutely do not justify an operation. We have no need to cite aneurism and cancer. These usually attack the vertebral bodies secondarily. This is also true in posterior malignant tumors which, however, against all surgical rules, have been operated upon, usually with deplorable results. It is also true of a certain number of intra-spinal tumors which are disseminated more or less over the meningeal canal. In these cases, as well as in those where the diffuse intra-dural lesion is due to tuberculosis, or syphilis, the operation if it has been begun through an error of diagnosis can only be exploratory.

(b) Much more frequent, however, are the cases of extra-medullary tumor when the operation, more or less easily performed, will lead to the most happy results.

(1) Sometimes it affects tumors with extra-spinal connections. The lipomata having without doubt their point of origin in the retro-meningeal fatty tissue have for a long time yielded fortunate results.

Hydatid cysts with an extra-spinal tumor have not given any better results than obtain in analogous cases elsewhere.

(2) Septic infection from pre-operative infection is fatal.

Successes here are still more surprising, because these intra-spinal tumors always lead to certain death either by exhaustion or by bed sores, vesico-renal, or pulmonary infection.

But the 150 autopsies prove that these tumors often present themselves under excellent conditions for operation; usually posterior or postero-lateral, of small volume, fixed either upon the pia mater or visceral arachnoid, or enveloping the nerves, or upon the internal or external face of the dura mater, by a very slender pedicle, or by a larger insertion, but made up of lax connective tissue, there are few or no adhesions, and they are entirely separated from the neighboring parts by their surrounding stroma. Therefore, whether they are extra- or intra-dural, extirpation is easy, relapse improbable. There is no destruction of the medullary substance, but only a slow compression, causing late medullary lesions like those in Potts' disease, and like them also liable to recovery, once the cause of compression is removed.

A case cannot be surely counted upon after a very prolonged compression. The age and intensity of curable compressions from extra-medullary tumor remain the only obscure points in their surgical study.

#### DIVERSE INDICATIONS.

*Bony Lesions.*—First of all, the different non-tubercular osteites. Traumatic vertebral osteitis, except compound fractures and gunshot wounds, is uncommon.

Certainly entirely distinct from the foregoing and from all other varieties of vertebral osteitis is the osteomyelitis of the spine.

The osteitis and other syphilitic lesions of the vertebra have also been operated upon.

The different lesions of the coccyx are also susceptible to surgical treatment under the name of coccygodynia. Formerly it was nearly always considered a simple neuralgia, and for its relief the ligaments and muscles attached to the bone were simply cut with the idea of cutting the nerves.

Our statistics show that coccygodynia is almost always the result of a fracture, a subluxation, sprain of the coccyx (lesions due to confinement or any other traumatism), and to a displacement and increased mobility of the bone.

It should then either be sutured to the sacrum or simply resected. The latter in nearly all cases has given the best results.

*Meningeal Lesions.*—Rarer and less known still than the preceding bony lesions are most of the meningeal lesions.

There is practically very little of value in this class.

The hypertrophic cervical pachymeningitis, "forming a circumscribed meningeal tumor of slow and fatal progress," can, according to Wyeth and Mills, be successfully treated.

We do not know of any operative attempt made on this disease, which, perhaps, will soon lose its individuality and become only a clinical type of different affections, such as hysteria, medullary sclerosis, meningeal tuberculosis, etc., none of which are operable.

A double trepanation, with lavage and drainage, is indicated in some cases of generalized suppurative perimeningitis without bony lesion. Here there is no danger of doing harm to the patient, as all the cases up to the present time have died.

Other operators have attempted the regulation of cerebro-spinal pressure by a trepanation and intra-dural drainage or punctures of the spine in tuberculous cerebral meningitis and hydrocephalus. If there is tumor or meningitis, operation can only be palliative. In coma, which in the course of these lesions might lead to death, there have been some results, but so slight and transitory as to be worthless. In hydrocephalus lumbar evacuation was expected to be curative, but up to the present time the facts do not realize this hope any more than drainage of the lateral ventricles. Lumbar evacuation, per-

manent or intermittent, constitutes in hydrocephalus a sufficient and logical treatment. Both diminish the cranial contents without affecting the bony envelope, but after more or less considerable extraction of the cephalo-rachidian fluid the cranium, even that of an hydrocephalic, does not retract its walls or fold its fontanelles enough to make up for the deficiency in the space that has been made. A congestion of the brain would result, and even a trouble of the general circulation, because of the quantity of blood which flows into the nerve centres and the pia plexus that surrounds them.

This sudden congestion is probably the cause of serious catastrophes that have followed the cerebral or lumbar punctures. They should be preceded by large craniotomies of a kind to allow the cranial vault to contract greatly under a graduated elastic pressure, when later on it could be emptied, preferably by lumbar puncture, and not interrupting the cranial shrinkage.

It remains to be seen whether hydrocephalic patients can endure these multiple and grave operations, and derive any benefit from them.

(c) *Spinal Cord Affections.*—In this group, which is more important than the other two, since it covers all medical affections of the spine and the cord, much has been attempted in different ways.

The principal success has been in intra-spinal section of the posterior nerve roots for intractable neuralgias. They have the following advantages :

(1) To prevent more surely than a lower section the course of an ascending neuritis, the superior limits of which are not known.

(2) To permit in cases of difficult diagnosis the exploration of the spinal canal, and if a tumor, the product of an inflammatory process, causing nerve or medullary compression, exists to remove it.

(3) To limit the section to the posterior roots, which prevents paralysis of the territory whose nerve supply is derived from the corresponding anterior root.

The opening of the dura mater and the intra-dural section will be naturally necessary to obtain this last result.

SAMUEL LLOYD.

## INDEX OF SURGICAL PROGRESS.

### GENERAL SURGERY.

**I. The Treatment of Malignant Tumors by Repeated Inoculations of Erysipelas.** By WILLIAM B. COLEY, M.D. (New York). The author reports ten original cases in which malignant tumors have been subjected by him to repeated injections of pure fluid cultures of erysipelas. In most cases the injections were made deeply into the tumors themselves. The doses employed have varied with the age and virulence of the cultures, the aim being to provoke a good reaction; a temperature of  $104^{\circ}$  to  $104\frac{1}{2}^{\circ}$  frequently following. The reaction usually subsided within thirty-six to forty-eight hours after the injection, unless erysipelas was produced. Out of upward of one hundred and fifty injections of pure cultures of the streptococcus of erysipelas, of almost every degree of virulence, superficially and deeply, in but two cases did an abscess follow, and in all of these, in which a careful bacteriological examination was made of the pus before it had become contaminated, mixed cultures were found, the staphylococcus aureus being also present.

In addition to his own cases, Coley has collected from literature and tabulated twenty-eight additional cases of carcinoma and sarcoma in which erysipelas, either spontaneous or artificial, intervened. Of seventeen cases of carcinoma, one other was well five years after the attack, three were permanently cured, ten were temporarily improved, and one died of the erysipelas. Of seventeen cases of sarcoma seven remained well and free from recurrence from one to seven years after the attack. One died from the erysipelas; temporary improvement was manifested in the remainder. Of four cases of either sarcoma or carcinoma two were cured.

The author is now experimenting with filtered cultures, the germs being thus removed without subjecting the filtrate to heat. The results have been so encouraging that, for the present, he has



decided to use the toxic products of erysipelas in preference to inoculating the germ itself. Thus the necessity for isolation is avoided, and the action of the products can be so carefully regulated, that the danger element can be entirely eliminated.—*American Journal of Medical Science*, May, 1893.

## NERVOUS SYSTEM.

**I. Removal of an Intradural Spinal Tumor.** By Dr. CAPONOTTO (Italy). A man, thirty-three years of age, received an injury to the cervical spine when six years old. Up to his nineteenth year he had no especial trouble, but at this time he began to have violent intercostal neuralgia and slight anæsthesia in both thighs. Shortly after this he developed motor trouble in the lower extremities, and could only walk on crutches. Paralysis of the bladder and rectum appeared the next year, and he also had a marked sensory disturbance below the fourth dorsal vertebra.

The second and third dorsal arches were resected, the dura mater was very tense, and when it was opened a round white tumor became visible, the upper edge of which corresponded to the third vertebra. It extended to the lower margin of the fifth vertebra, requiring the removal of the fourth and fifth arches. The whole interior of the dural cavity was filled by the tumor. Hardly any trace of the cord could be discovered, and consequently there was no improvement in motion or sensation. The growth proved to be a fibro-sarcoma.—*Riforma Med.*, VIII, 271, 1892.

**II. Operations for Compression of the Spinal Cord by Dislocation of the Vertebra.** By Dr. URBAN (Leipzig). The advantages of the method of temporary resection of the laminae is summarized as follows: It affords a free and complete view of the entire vertebral canal and its contents. The vertebral arches and bodies and the spinal cord are easily accessible to inspection and palpation. It enables us to remove the cause of the compression wherever it may originate.



There is no unnecessary loss of tissue, the compressing portion alone being removed, the normal lumen of the vertebral canal restored, and the vertebral arches replaced.

The indications for the operation are: (1) Vertebral fractures with compression of the cord. The operation may be performed early, unless the symptoms are improving. (2) New formations in the spinal canal. (3) Tubercular spondylitis, when the process has been arrested and no abscesses are present. (4) The operation is justified in all cases of localized compression on the spinal cord.—*Arch. f. Klin. Chir.*, XLIV, 4, 1892.

#### HEAD AND NECK.

**I. A Case of Craniectomy for Microcephalus.** By Dr. B. Joos (Winterthur). A boy, four years of age, a microcephalic idiot, unable to talk, and not even knowing his name, very restless, with incontinence of urine and fæces, very irritable and with a prolapsus of the rectum, was admitted to the hospital for operation. Linear craniectomy, under chloroform narcosis, was performed by Dr. Walder, the incision being made to the right of the sagittal suture, from the lambdoid suture, to the anterior limit of the hair. The skull was opened with the chisel, and a canal was cut in the skull with cutting forceps, as wide as the index finger and the whole length of the cutaneous incision. The skull was very thick and sclerosed, hæmorrhage considerable. The dura mater was left intact, as the general condition and pulse were bad. There was slow but distinct improvement, but not in speech. Seven months later a second operation was undertaken, and a transverse linear excision of a portion of the skull was made on the left side of the head, a strip 2 to 2½ cm. in width, running from 2 cm. above the left ear up to the former longitudinal excision. The wound healed in a few days, and the child, now one and a quarter years after the first operation, is markedly improved. He pronounces words, calls correctly for objects with which he is familiar, plays with other children, but still continues to be very irritable.

An oblong groove along the sagittal suture and a transverse one on the left side are distinctly visible, and in the transverse line the cerebral pulsations are still visible. The skull measurements have increased several centimeters.—*Correspondenzblatt f. Schweiz. Aertz.*, March 15, 1893.

**II. Extirpation of an Endocranial Sarcoma.** By J. NICOLAYSEN (Norway). A man, fifty years of age, had suffered for many years with right-sided headache, vertigo and nausea. A tumor in the right temporal region had increased until it reached the size of a child's fist, when he was admitted to the hospital. The patient was not very intelligent. The tumor was solid, elastic, immovable, pulsating, and projected like a fungus from a depression of the skull. There were no spasms and no paralysis. The deeper portions of the temporal muscle were infiltrated with tumor masses, and the whole muscle and the fascia were removed. The tumor was yellowish white, of the consistency of coagulated albumen, and was not surrounded by a capsule. It had evidently started from the diploë. It was only slightly adherent to the dura mater, and this membrane was not infiltrated. There was a depression in the surface of the cerebrum, of a depth of  $3\frac{1}{2}$  cm., and  $4\frac{1}{2}$  cm. wide, made by the tumor. The whole mass, together with 1 cm. of the surrounding bone, was removed, and microscopical examination proved it to be a round cell sarcoma. The patient appears to be cured. It is surprising that there should be so few symptoms of cerebral compression with so great a depression in the frontal and temporal convolutions.—*Norsk. Mag. for Lægevid.*, November, 1892.

**III. Trephining for Traumatic Epilepsy.** By Dr. A. FRAENKEL (Vienna). A soldier had a longitudinal scar on the head, 4 cm. long and a few cm. to the left of the anterior third of the sagittal suture; in its centre a small fistula was present, surrounded by granulations from which small quantities of pus were discharged synchronously with the beating of the heart. A depression of the bone below the scar, and the purulent secretion from the fistula,

together with hemiplegia and fever led to trephining. When the bone was laid bare some splinters were discovered, and their removal was followed by an escape of more pus, and a black object became visible at the bottom of the wound. This proved to be a bullet. The bone was chiseled away circularly for about 3 cm., and an unusually large projectile was removed from a cavity about 5 cm. in depth. A loose splinter of bone lay beneath it. The foreign body was imbedded in granulation tissue, which penetrated the cerebral substance and contained a great deal of pus. All symptoms quickly disappeared, and on the tenth day functional power began to return, and he was cured in six weeks.

Genuine epilepsy is not considered a subject for surgical interference. The published successes in these cases are only apparent. Only one form of epilepsy, Jacksonian, should be treated by operation. It is established, without doubt, that a complete destruction of the motor centre is followed by complete and lasting paralysis, descending degeneration of the pyramidal tracts in the spinal cord, and by a secondary contraction of the paralyzed limbs. It is, therefore, evident that the extirpation of a part or all of the psycho-motor centre gives rise to a corresponding loss in the functional relations, that is to lasting paralysis of the groups of muscles controlled by the centre involved. When, therefore, the extirpation of diseased motor centres of the cerebral cortex are not accompanied by a lasting loss of function, and the removal of the focus of the disease was consequently not complete, it should not be surprising when the pathological conditions return with the return of functional power.

The incomplete extirpation of the centre from which the epileptic spasm originates, is, therefore, one of the reasons for the return of the morbid condition.—*Wien. Klin. Woch.*, December 8, 1892.

**IV. Intracranial Abscess of Otic Origin.** By M. PICQUÉ (Paris). For this variety of abscess there may be no symptoms other than pain and fever; even the mastoid inflammation may be absent. Prompt intervention is required as follows: Open the mastoid cavities,

enlarge the opening upward so as to open the cranial cavity in the neighborhood of the upper face of the petrous bone. This procedure, though hitherto regarded as exceptional, must be considered as preferable. Even in encephalic abscesses, with clearly defined psychomotor localization symptoms, this method should be resorted to at the first operative step before employing the trephine on the exact level of the abscess.—*Bull. et de Mem. de la Société de la Chirurgie de Paris*, February, 1893. SAMUEL LLOYD, New York.

**V. Pyæmic Thrombosis of the Lateral Sinus Following Acute Otitis; the Sinus Opened and the Internal Jugular Vein Dissected Out.** By G. LENTHAL CHEATLE, M.R.C.S. (London). A girl, aged thirteen years, with a history of eight days' left earache and headache with pain in the upper left side of the neck, increasing in severity and complicated with vomiting, rigors two or three times a day and twitchings during sleep, presented nothing abnormal externally; percussion within an area of two and a half inches posterior to the left pinna gave rise to moderate pain, which was felt more intensely upon digital examination of the upper part of the neck, which was then seen to be swollen but without fluctuation. The membrana tympani was dry and the vessels accompanying the handle of the malleus were congested; there was no marked bulging. The temperature was  $102^{\circ}$ , the pulse 116, and the respiration 44. The case was otherwise normal.

In view of the persistent and imperative character of the symptoms it was decided (1) to chisel into the mastoid antrum; (2) if necessary to open up the mastoid cells, and (3) if nothing deemed sufficient to account for the symptoms could then be found, to chisel backward and open up the mastoid sinus. After suitable antiseptic precautions, a curved incision two inches long was made a quarter of an inch behind the pinna of the left ear, the periosteum detached and the mastoid antrum opened by means of the chisel and mallet. On the first introduction of the chisel into the antrum gas bubbled out with the blood. The opening thus made was enlarged, during

which process a few streaks of thick pus came away, but there was no distinct evacuation of any collection; scraping with a sharp spoon only removed old cheesy degeneration, without offensive odor, and it was thought that so far the cause of the severe symptoms had not been revealed. An incision was accordingly made backward from and at right angles to the preliminary cut; the opening in the skull was enlarged upward, backward and downward. More cheesy matter was scraped away; the dura mater covering the temporo-sphenoidal lobe bulged considerably into the upper part of the aperture, but exploration of the lobe was negative. The lateral sinus was then completely exposed, and the needle of a hypodermic syringe brought from it no blood or pus, and was found to have a very offensive odor on withdrawal. The outer wall of the sinus was next thoroughly opened by a longitudinal incision, and on scraping out the contents fetid gas bubbled up. A probe was then thrust upward toward the torcular Herophili and downward toward the internal jugular vein, but no blood could be made to flow, and on withdrawal the probe had a most offensive odor. The internal jugular vein was then ligatured in two places and divided between them. The lateral sinus was scraped with a sharp spoon and syringed out with a sublimate solution in the hope of removing the original source of infection.

The temperature fell temporarily, and the symptoms were alleviated, but they rose again, and three days later the opening in the skull was enlarged, particularly in a backward and downward direction, where the dura mater had become separated from the skull and where a dependent position for drainage could best be obtained and the burrowing of inflammatory material toward the cerebellum prevented. The lateral sinus thus further exposed was laid open, the clotted offensive contents scraped out with a sharp spoon and the outer wall entirely removed, practically obliterating the sinus, the upper end of which was allowed to bleed for a few seconds in order to clear away as much as possible the remaining offensive clots; the hæmorrhage was easily controlled by light pressure. The wound in the neck was then reopened and the internal jugular vein dissected

out as far as possible in the direction of the skull. After syringing a sublimate solution from the remains of the sinus through the remnant of the internal jugular vein into the wound in the neck, driving out much offensive clot, the wounds were closed and dressed antiseptically and the patient made a good recovery.—London *Lancet*, March 4, 1893.

**VI. Treatment of Aural Pyæmia by Operation.** By ALFRED PARKIN, F. R. C. S. (Hull, England). The author submits two cases as examples of the value of ligating the internal jugular vein and removing septic matter from the lateral sinus in patients far advanced in pyæmia, whose recovery without interference is doubtful.

(1) A boy, aged nine years, with history of headaches for six years following scarlet fever, complained of right earache, and during the succeeding night is said to have been unconscious, and later had attacks of shivering. The patient seemed dull and stupid, and complained of pain all over the right side of the head; there was a foul discharge from the ear with a tenderness over the mastoid and the deep vessels of the neck; the tongue was dry and brown; the eyes were jaundiced, and the liver was an inch below the ribs and very tender; there were numerous râles at the base of the right lung, with tubular breathing at one spot; both optic discs were swollen, the right nerve then the left; and the evening temperature was 104.4° F. Under chloroform a curved incision was made behind the right ear, and a small collection of pus around the aperture of exit of mastoid vein confirmed the diagnosis. The antrum, first opened by gouging away half an inch of hard bone, was found to be full of foul pus, which was cleared away with the contents of the middle ear, and the whole cavity disinfected. The bone bounding the lateral sinus was then gouged out and a quantity of extra-dural pus extending along the lateral sinus groove was removed; the sinus was obviously thrombosed. Consequently the internal jugular vein was exposed low down in the neck; the vein walls were so thickened by periphlebitis that it resembled rather an empty carotid artery; it was tied down as low as possible in two places, and the piece excised showed numerous



flaky deposits on the intima; the cut ends of the vein were disinfected and the wound sewed up. The lateral sinus was then opened up, as much of the clot as possible scraped out, and the cavity treated with sublimate solution. A drainage tube was placed in contact with the sinus wall and a second one in the antrum and the wounds duly dressed. Prompt relief was experienced and recovery followed.

(2) A girl, aged eleven months, with history of scarlet fever three months previously and recently recurring fits, was semi-conscious, with blue lips and occasional cries, accompanied with putting the hand to the left side of the head; the pulse was very rapid; the temperature subnormal. There was a small swelling behind the left mastoid, about an inch and a half behind the ear, and a foul discharge from the ear itself; the left side of the face was paralyzed, bronchial breathing and râles were audible at the base of the left lung, but nothing was perceptible in the neck. Under chloroform the small abscess was opened at the back of the mastoid, and found to communicate through the foramen of the mastoid vein with the interior of the skull. The antrum was opened and, with the middle ear, was cleansed of a quantity of foul material. The lateral sinus was exposed and found to be full of broken-down clot, which was all scraped away. The internal jugular vein was then exposed, found empty and tied; there was no periphlebitis at the point of application of the suture. The patient made a rapid recovery.—*London Lancet*, March 11, 1893.

**VII. A New Method of Reducing Dislocation of the Lower Jaw.** By FELIX ROTH, M.R.C.S. (London). (1) The patient seated in an ordinary chair, the operator stands before him with one foot placed slightly to the right side and the other just in front of the patient and in the middle line. (2) He then flexes himself at the hips and causes the patient to lean forward and to place his forehead at the middle of the operator's sternum—but this position varies with the size of the patient's head. (3) The operator now flexes his head so that his chin grips the patient's head about the upper part of the occipital bone, thus acquiring a firm hold with the



head well under control between his chin and chest. (4) The thumbs, protected in the usual manner, are placed in the patient's mouth and the fingers of both hands grasp his lower jaw. The author considers that his method has the following advantages: (*a*) The operator has the head under perfect control and perfectly fixed; (*b*) the line of force exerted by the operator's hands acts in the same line as the resisting force exerted by the operator's chin; (*c*) the operator's elbows, being well flexed, he can exert a greater power by the force acting through the thumbs close to the shoulders; the terminal phalanges will be found to have greater muscular power; (*d*) the patient's head is in a better position for reducing the dislocation; and (*e*) the operator needs no assistant, and does not inconvenience his patient by excessive pushing and pulling the head about during the reduction.—*London Lancet*, February 25, 1893.

JAMES E. PILCHER (U. S. Army).

#### CHEST AND ABDOMEN.

##### **I. A New Method of Opening the Thoracic Cavity.**

By DR. DELORME (Paris). Delorme proposes a new method of opening the thorax in place of Estlander's operation. A flap is formed of the soft parts and the ribs, which is laid over to one side, thus giving greater access to the field of operation. After the operation one has only to replace the flap and suture it in its place. By means of an incision which forms the three borders of a right angle, a flap is made posteriorly with its base above and running from the third to the sixth rib, its upper and lower borders being parallel with the margins of the ribs and extending from the sternal border of the scapula to within two fingers breadth of the outer side of the sternum. At the anterior border of this flap the ribs and intercostal muscles are cut through, while at the posterior the ribs are but slightly cut and the intercostals left intact. After the upper and lower borders are freed the flap is laid over to one side. The writer first used this method in a case where a patient suffered from a tuberculous abscess of the left thoracic cavity which extended far into that cavity. As excision of the external pus cavity and curretting of the internal

diverticle was insufficient he tried this procedure. He then easily could excise the thickened wall, corresponding to the costal pleura, as well as the fungous cavity that involved the left lung and the pericardium. This method is also of service in obliterating cavities which remain after empyema operations, as experiments on the cadaver have demonstrated. In conditions where resection is now done it will be useful, and especially in the treatment of hæmorrhages of the lungs and pneumothorax after injuries. The advantages of the method in traumatic hæmorrhages of the lungs were distinctly shown in the case of an officer who, in an attempt at suicide, had stabbed himself three times in the chest with a double-edged amputating knife. The writer was called to him on the third day and found him greatly reduced in consequence of repeated hæmorrhages, thread-like pulse, hurried respiration, great anæmia, etc. After opening the thorax three bleeding wounds in the lung were found and secured. A fourth bleeding point was discovered in the pericardium and secured by the hæmostatic forceps. Unfortunately, the patient died soon after operation, in consequence of being so weakened from the hæmorrhages. At the autopsy all the wounds were found to be obliterated, so that it is safe to assume that an earlier intervention would have saved him—*Wiener medizinische Presse*, No. 15, 1893.

**II. Contribution to Pulmonary Surgery.** By Prof. I. HOFMOKL (Vienna). Since pulmonary surgery, with the more comprehensive works of Hallister, Fenger and E. Bull, has begun to be more systematically considered, there has accumulated quite a quantity of casuistic material. Tizebicki, of Prof. Hofmokl's clinic, presents the following statistics:

	Total No. Cases.	Cures.	With Fistula.	Unimproved.	Dead.	Result Unknown.
(1) Abscess of the Lung,	42	14	3	—	24	1
(2) Pulm. Gangrene,	24	7	1	1	13	2
(3) Tuberc. Cavities,	24	5	—	5	9	5
(4) Bronchiectatic Cavities,	12	—	—	1	8	3
(5) Echinococcus of the Lung,	45	37	1	—	6	1
(6) Pneumectomy (Resections),	5	1	—	—	—	4

Among the cases of tuberculous pulmonary cavities one died after three years of tuberculosis. To these cases are to be added two more from Hofmokl's clinic, a pulmonary abscess, following an acute right-sided pleuropneumonia and a case of putrid bronchitis, both with recovery. Hofmokl advises preliminary resection of a rib in order to have room to operate. The focus should be opened with the thermocautery, with which the hæmorrhage is slighter.—*Wiener medicinische Presse*, No. 48, 49, 1892.

**III. Hysteric Tumors of the Mammary Gland.** By GILLES DE LE TOURETTE (Paris). Gilles de la Tourette divides the mammary hysteric manifestations into two principal varieties: A diffuse, extensive swelling or localized tumor. In general, they are characterized by a marked superficial hyperæsthesia which is peculiar to these growths. Even the slightest touch, or even grazing them, is insupportably painful. This zone of hyperæsthesia is also hysterogenic; then pressure will bring about an attack. The oedema which accumulates around the tumefaction may give rise to ulcerations, and, in this condition, the analogy, with a malignant tumor, is still greater; indeed, cases are known where they have been operated upon. As to the treatment, compression will have no influence, and only treatment of the hysteria will bring about a cure.—*La Semaine Médicale*, No. 23, 1893.

**IV. On the Indications for Laparotomy in Ileus.** By H. SCHLANGE (Berlin). The writer, after demonstration of a patient, before the Berlin Surgical Society, on whom he had performed laparotomy for acute ileus, with subsequent primary resection of a piece of intestine 135 cm. in length, considers the indications for operation in ileus. He points out the importance of individualizing each case, and that to-day no one is justified in calling himself an adherent exclusively of either operative interference nor of treatment by opium, in all cases, on the other hand. He divides the cases into three classes:

1. If the abdomen is found to be more or less distended, the

intestinal convolutions visible externally, while peristaltic movements are noticed to be present, either spontaneously or from mechanical impression, as from percussion of the abdomen, or if, on auscultation sounds are heard, then it is safe to assume that there is no diffuse peritonitis present, which always paralyses the intestine and prevents peristalsis. Rather should one suspect a local intestinal trouble that impedes peristalsis, and, though the cause is often difficult to determine, laparotomy is indicated when the symptoms appear suddenly, and are obstinately persistent. It is safe, then, to suspect that a convolution of the small intestine is involved, for example, incarceration of a short loop in the true pelvis, obturator hernia, etc. If, on the contrary, the symptoms have developed slowly, and are less violent, one may wait, especially when the patient has already had such attacks before. One may here suspect that there is an adhesion between the gut and the gall bladder, uterus, vermiform appendix, etc., hindering peristalsis, and which may undergo spontaneous separation.

2. If the abdomen is distended like a barrel, the intestines neither visible nor palpable, no sign of peristalsis, then there is an extensive paralysis of the intestines from diffuse peritonitis. Here an operation will offer but little chance, and laparotomy will only hasten the fatal result. At the most, one is only justified in a minor operative procedure as forming an intestinal fistula, in order to relieve the distended gut. A certain per cent. of these cases recover without operation.

3. The indications are most distinct in the third class. Here only a limited portion of the intestine is affected, while the other portions of the gut are apparently normal. The greatly distended section of intestine shows no sign of peristalsis, and is, for the moment, paralysed. Such is the picture of a grave incarceration of a large convolution of intestine by a band or from twisting on its axis, without diffuse peritonitis having supervened. The symptoms are always violent, the patient's strength decreases rapidly, and, if one will save his patient, it is only possible by means of a laparotomy quickly done.—*Berliner klinische Wochenschrift*, No. 47, 1892.

**V. Statistics of Hernias Operated on in the Sahlgren Hospital at Goeteborg, Sweden, from 1883-1893.** By ALRIK LIND (Goeteborg, Sweden). During these ten years 306 cases of hernia were received at this institution. Of these, 151 were reducible or irreducible hernias, and 155 incarcerated ones. Out of these, 176 were males and 150 females; in 193 the rupture was inguinal and 107 crural. A radical operation was done in the reducible or re-irreducible cases 140 times. Two of these died, leaving a resultant mortality of  $41\frac{1}{2}$  per cent. The radical operation was performed in the usual manner, by ligation of the hernia sac with catgut or silk and subsequent extirpation. In some of these cases sutures were applied to the ring, though not in all. Five were operated on after Bassini's method. In two of these the silk ligatures were cast off and fistulæ remained to retain the patients in the hospital for quite a long time. This he ascribed to imperfect sterilization of the suture material. Recurrences were observed after radical operation. After the operation he advises caution in leaving off the truss, especially in working persons. Small children appear to bear this operation better than adults. Eighteen children under three years were among those operated on, and out of these there were one infant of five months and one of seven months. Two children of two and a half years and three years respectively, were operated on for a double-sided hernia at one séance. These cases varied from the slightest to the very gravest. Among the unusual ones was a eleven-year-old girl, with a double congenital inguino-ovarial hernia. The hernial sacs were bound down to the labia majora by means of very resistant and strong bands. The ovaries were fastened to a very narrow and thin pedicle, which was closely adherent to the posterior portion of the inguinal canal, and reaching from the inner to the outer ring. This was not separated, but as soon as the restraining bands at the labia majora were severed, they retracted into the inguinal canals, and the outer ring, could be sutured. The result was good, though the patient was obliged to wear a truss. Among the other contents of hernial sacs were the cæcum, Fallopian tube, vermiform appendix,

etc. Three cases of umbilical hernia in new-born children were operated upon; two of these, in whom various organs were adherent to the hernial sac, died, while the third survived. During these ten years 155 persons were under treatment for incarcerated hernia. Of these 33 died (21 per cent.). In 22 the hernia was reduced by taxis or other non-operative measures. One of these died of intestinal gangrene. The other 133 underwent operation. Of these, 32 died (24 per cent.). In 12 cases the cause of death was peritonitis; in 7, ileus; in 4, pneumonia; in 1, enteritis; in 2, heart affections, and in 5 no cause was to be discovered. During the last four years the mortality rate was  $18\frac{1}{2}$  per cent., while the last two years gives one of  $9\frac{1}{2}$  per cent., which difference is due to the public having gained more confidence in the treatment at the hospital and entering earlier. Out of those operated upon, 67 had reached the sixtieth to the eightieth year. Several of the patients had entered after the incarceration has lasted six to eight days, yet some of those died who had been brought in on the first or second day; in these the incarceration had been so severe that gangrene set in. In all, gangrene was observed in 28 cases. The mortality seems to have fallen during latter years; for example, in 1891 only one case of twenty herniotomies for incarceration died.—*Hygiea*, No. 2, 1893.

FRANK H. PRITCHARD (Norwalk, Ohio).

#### **VI. Strangulated Inguinal Hernia in an Infant Eight Months of Age.** By J. D. T. RECKITT, M.R.C.S. (British Army).

A male subject of congenital left inguinal hernia, aged eight months, presented a pale, pinched countenance and great pain, with the hernia irreducible; taxis, fomentations, enemata and other means of reduction failed. Then, under chloroform, the sac was opened, and though the finger could be run all around the inside the usual amount of fluid did not escape. A small cut was then made into a part of the next covering of the hernia, which gave immediate exit to the fluid previously expected, and on laying this sac freely open the bowel was exposed. The stricture was very tight, and notched with



difficulty on account of the patient's tender age, but when done the bowel was easily returned. On account of poor light and a tendency of the testicle to jump up into the wound whenever traction was made with the forceps, but little of the sac was excised. A radical cure was also abandoned on account of the dangerous proximity and uncertain position in such a light of the spermatic vessels and cord. The edges of both sacs were drawn together with the integuments by silver wire and the wound dressed. The patient made a good recovery. The points of interest in the case are the tender age of the subject and the two sacs, the former the cause of the latter.—*London Lancet*, March 18, 1893.

**VII. Re-Union of Colon by Simple Suture after Exsection.** By FREDERICK TREVES, F.R.C.S. (London). A woman, aged forty-four, with a history of several attacks of intestinal obstruction during the previous year, had been treated for stricture of the large intestine by enemata, aperients and diet, by which an enormous quantity of feces was evacuated and his patient relieved. The relief was but temporary, the need for aperients became more pressing, and severe obstructive attacks more frequent; pain became a factor, enemata produced but little effect, and the abdomen was greatly distended with ascitic fluid. The abdomen was opened, a diagnosis of epithelioma being made from the absence of symptoms of simple intestinal stricture, and after the escape of a large bucketful of ascitic fluid, an annular epitheliomatous growth was found on the summit of the sigmoid flexure, presenting the usual simple ring, with no adhesions to adjacent parts, and no extension beyond the bowel. The abdomen having been freed of all ascitic fluid, the affected loop of bowel was drawn out of the wound and numerous sponges were wedged around it so as to make the operation in every respect extra-abdominal. Involving an inch and a half of the colon, the gut above was greatly hypertrophied and so distended as to equal the adult forearm in circumference and below thin, empty and contracted. The colon above and below was clamped by an assistant's fingers, and



seven inches of the sigmoid flexure and a V-shaped portion of the mesocolon cut away with scissors, the contents of the segment being received upon a special sponge. The interior of the bowel was cleaned and the gap in the sigmoid mesentery closed by two silk sutures. Next, the divided end of the greatly distended upper segment was partly closed, so that its lower part should correspond to the lumen of the collapsed bowel below, by means of a continuous suture of the mucous membrane followed by an outer line of Lembert's sutures; for each suture, No. 1 silk braid was employed, a milliner's needle being used for the continuous, and a small round Hagedorn's needle for the interrupted sutures; the upper segment of the bowel was as rigid as if made of leather. The two ends of the gut were now joined together in the same way, a colleague inserting the stitches in one end while the operator was introducing them at the other, about fifty stitches being employed. Relaxation of the assistant's fingers allowed the contents of the bowel to pass through, showing that the suture line was water-tight at all points. The abdominal wound was closed and dressed in the usual way and the patient passed on to recovery, the bowels moving first on the third day, when five liquid motions were passed.—*London Lancet*, March 11, 1893.

**VIII. Acute Inflammation of the Gall Bladder Closely Simulating Acute Intestinal Obstruction.** By W. ARBUTHNOT LANE, M.S. (London). A man, aged fifty-four, had suffered from many attacks of bronchitis and gout, and had suffered previous attacks of abdominal pain. He was seized with a sudden severe abdominal pain, accompanied by vomiting, which became less frequent and ceased on the following day. The bowels would not move, and his pain was incessant, which, with some distention, was rather more apparent on the right side. After four days he was in a very prostrate condition, with a small, rapid pulse and a very distended, painful and tender abdomen, the hardness and fulness being most distinct about the right hypochondriac region. No evidence could be obtained of biliary colic or previous trouble in his gall bladder, of

attacks of intestinal obstruction, and nothing wrong could be detected in the right iliac region, although the cæcum and the small intestine were greatly distended. There was no sign of distension of the colon to the right of the median line. With a diagnosis of obstruction of the large intestine immediately beyond the hepatic flexure, the abdomen was opened, exposing a very thick layer of firm lymph covering the edge of the liver and extending down over the adjacent transverse colon; beyond this the colon was empty, while the transverse colon was much distended. Removal of the intimately adherent lymph from the transverse colon showed the duodenum beneath covered with the same cake of inflammatory material, and in immediate relation with both these structures and covered by the same mass of lymph was found a tensely distended gall bladder, not larger than usual, but very acutely inflamed. The whole of the lymph was carefully removed, and the gall bladder was tapped, giving exit to a quantity of thick muco-pus; no stone was found. The wound was closed, the gall bladder drained, and the patient made an uninterrupted recovery. The acute onset of the symptoms in the case is difficult to explain. A point of much interest was the peculiar local action of the lymph in paralyzing the transverse colon and duodenum and preventing the passage of the intestinal contents through the affected part.

The author refers to another, but less severe case which he had since observed in a woman, aged seventy-two, in whom a history of attacks of indigestion and other symptoms of distended gall bladder, recurring for many years, made the diagnosis easy; though she did not refer her pain to the location of the gall bladder, the organ could be distinctly felt and was very tender.—*London Lancet*, February 25, 1893.

JAMES E. PILCHER (U. S. Army).

**IX. Surgical Affections of the Gall Bladder and Bile Ducts.** By A. W. MAYO ROBSON (Leeds). The author has operated on more than fifty cases of cholelithiasis, and among the complications and dangers for which help has been sought have been:

Repeated attacks of biliary colic, so-called "spasms," without jaundice.

Biliary colic with persistent jaundice and its consequences, such as hæmorrhage.

Intermittent pyrexia, with jaundice and pain.

Persistent vomiting, with such serious digestive disturbances as to threaten death from inanition or exhaustion.

Acute intestinal obstruction due to impaction of a large gall-stone in the bowel, or to peritonitis.

Stimulation of intestinal obstruction due to irritation and pain.

Localized peritonitis, with or without ulceration of the bile passages.

Perforative peritonitis.

Septicæmia due to ulceration of bile passages.

Abscess of liver.

Empyema of gall bladder.

Dropsy of gall bladder.

Abscess of abdominal walls.

Pyelitis of right kidney, and collapse due to intense pain.

The cause of the mischief, the gall stones, may be found anywhere in the biliary tract, and although usually discovered in the gall bladder or in the cystic or common ducts, they may be found in the hepatic duct before it joins the cystic, or even in its ramifications in the liver. Where there is neither jaundice nor distension of the gall bladder, and when so-called "spasms" are frequently recurring and do not yield to medical treatment, the gall stones will usually be found in a shrunken gall bladder or in the cystic duct, but where jaundice is present the stones will probably be found in the common duct; and in either of these cases my almost invariable experience has been to find numerous and very firm adhesions, showing that the attacks have been frequently associated with local peritonitis. Where there is distension of the gall bladder, associated with pain but without jaundice, one large gall stone or several smaller ones will probably be found blocking the neck of the gall bladder and the cystic duct.

Where there is persistent jaundice, with distension of the gall bladder and without marked pain, malignant disease is to be suspected, especially if there is an absence of the intermittent pyrexia which usually coexists with the presence of gall stones in the common duct; and as operation in malignant cases is undoubtedly very much more dangerous than in simple cholelithiasis, the suspicion should be borne in mind, although in many of these cases an exploratory operation may be undertaken in the hope of finding something that can be relieved, or of relieving the cholæmia by diverting the course of the bile.

There is decidedly room for improvement in the diagnosis of cholelithiasis, especially when the question of malignant disease has to be taken into consideration; and in many cases it is almost impossible to differentiate between the mechanical blockage of the common bile duct from malignant disease which has not advanced far enough to produce cachexia, and that from gall stones; although as a rule in the latter there will be history of preliminary attacks of spasms, of pain preceding the jaundice, and of intermittent pyrexia, with absence of enlargement of the gall bladder. The last-mentioned sign is worth remembering, as all the cases of malignant disease with jaundice on which Robson operated have had distension of the gall bladder, so as to form a perceptible tumor.

For purposes of diagnosis the author advises to make a small exploratory incision, then to empty the gall bladder by the aspirator, and afterward to explore the bile passages with the fingers.

Cholecystotomy is the operation *par excellence* in the treatment of gall stones, and although, as often happens, where there are adhesions and a shrunken gall bladder, it is an operation of considerable difficulty, statistics prove that in the absence of malignant disease and persistent jaundice it is a procedure attended with little risk. Out of thirty such cases on which Robson has operated all recovered. Even in the presence of cholæmia the mortality, in the absence of malignant disease, is very small, for out of fifteen cholecystotomies for jaundice with gall stones in the absence of cancer, Robson has not lost one patient as a result of the operation.

As worthy of trial for averting danger from hæmorrhage in cholæmic cases, the author supports the use of chloride of calcium in fifteen-grain doses every four hours for two days previous to operation. Temporary drainage of the gall bladder after cholecystotomy is preferred to attempts at immediate suture.

Instead of suturing the edges of the incision in the gall bladder to the skin, Robson fixes it to the aponeurotic layer of the abdominal wall, and thus lessens the danger of a fistula, as between the opening in the gall bladder and the skin is a layer of tissue which soon becomes covered with granulations, and the contraction in healing usually secures closure.

Drainage of the gall bladder not only presents the advantage of treating the vesical catarrh by securing physiological rest, but in case the ducts have not been cleared it becomes possible to apply through the fistula hot water or some solvent solution directly to the concretions. Where the gall bladder is shrunken and cannot be brought to the surface, often it is possible to tuck the parietal peritonæum down, and suture it to the margins of the incision in the viscus, but where this cannot be done then the surgeon utilizes the omentum, suturing it to the gall bladder and to the parietal peritonæum, thus occluding the peritoneal cavity. Where occlusion in this way cannot be effected, the insertion of a drainage tube into the gall bladder without suture of the margins to the wound seems to be efficient, for it is apparently easier, on account of intra-abdominal tension, for effused fluids to discharge directly through the tube than to pass among the viscera; and probably within forty-eight hours the drainage track from the gall bladder to the surface is quite formed, and no longer communicates with the general cavity of the peritonæum. In clearing the ducts of concretions, the surgeon must be guided by circumstances; as a rule, forceps within the duct and the fingers outside will overcome any difficulty in the cystic duct, and occasionally stones may be worked backward by the fingers even from the common duct.

Not infrequently the common or even at times the deeper part

of the cystic duct cannot be cleared in this way, and then cholelithotripsy may be attempted. In a number of cases the author has crushed stones in the ducts, and afterward found the fragments in the motions. He first tries to crush them between the finger and thumb, and failing this employs forceps covered with india rubber. At times this method will fail, when incision of the duct and removal of the concretion may be done; the opening in the duct being sutured, and the right kidney pouch drained. In two cases Robson found the gall bladder displaced, and projecting into the right loin, as if the liver had been rotated to the right. In both of them he was able to crush the stones, and clear the ducts without opening the shrunken gall bladder, that is, to perform cholelithotripsy without cholecystotomy.

The following conditions are indications for cholecystotomy:

(1) In frequently recurring biliary colic without jaundice, where medical treatment has failed.

(2) In persistent jaundice, where the onset was ushered in with pain, and where recurring pains, with or without ague-like attacks, render it probable that the cause is gall stones in the common duct.

(3) In distended gall bladder from impaction of calculi in the ducts.

(4) In empyema of the gall bladder.

(5) In persistent jaundice with enlargement of the gall bladder dependent on some obstruction in the common duct, even where the cause cannot be clearly made out, but in such cases the increased risk should be borne in mind, as malignant disease may not improbably be the cause of the obstruction.

*Cholecystectomy.*—Robson has had three cases in which cholecystectomy had to be done in consequence of stricture of the cystic duct leading to an accumulation of mucus in the gall bladder, and distress when the fistula was allowed to close. After removal of the gall bladder complete recovery ensued in all. The operation is not difficult, and in his last case a single fine silk ligature around the cystic duct answered quite as well as the more complicated procedures.

Cholecystectomy for cancer can very seldom be called for.



The following conditions are indications for removal of the gall bladder :

(1) Where, after cholecystotomy, a mucous fistula persists, dependent on stricture of the cystic duct.

(2) Where, under similar circumstances, owing to accumulation of fluid in the gall bladder, the pain recurs as soon as the fistula has closed.

(3) In cancer, if the disease be limited to the gall bladder.

Wherever there is obstructive jaundice, cholecystectomy is contra-indicated.

*Cholecystenterostomy*, though not an easy operation, seems to be a successful one, for, out of eight reported cases, seven recovered. In the only case of cholecystenterostomy performed by the author in 1889 for biliary fistula, due to stricture of the common duct, the patient is at present in excellent health.

The author suggests the use of a small decalcified bone tube, like a spool for thread, in facilitating the union of the gall bladder and intestine, the tube being introduced into an opening in each viscus while the membranous margins are sutured by a double row of continuous suture.

The indications for cholecystenterostomy are :

(1) In closure of the common duct from stricture where the jaundice is and must be persistent, unless another channel for the bile can be made.

(2) In tumor producing obliteration of the lumen of the common duct, thus leading to persistent jaundice, but if the tumor be made out to be malignant the simpler procedure of cholecystotomy had better be performed.

(3) In cases where the gall bladder is distended and it is found impossible or impracticable to clear the common duct of gall stones.  
—*British Medical Journal*, April 15, 1893.

**X. Removal of Appendix for Relief of Chronic Relapsing Appendicitis.** By WILLIAM T. BULL (New York). The author reports twelve cases, all of whom were in other respects in



good health. In addition to the history of repeated attacks, eight cases have presented evident tumors in the iliac fossa, of varying position and distinctness. The tumor was more distinct the nearer the time of examination approached the subsidence of the last attack. In four cases there was no tumor, but a tender area corresponding roughly to the point emphasized by McBurney as of diagnostic value. Once only the loin was tender. But all the patients without a distinctly palpable tumor had a history of continuous discomfort, or pain on exertion, with or without regularity in the action of the bowels. Four patients were never entirely well after the first attack. In one of these the indurated mass, six weeks after the onset of the second attack, was as large as the fist, and plainly to be felt by rectum. Four months later, at time of operation, it was as large as the thumb. Two patients were unwilling to travel, convinced by previous experience that their pleasure would be frequently interrupted, and apprehensive of the increased severity of future attacks; six patients were unable to pursue business, or laborious occupations, or to go to school without frequent abdominal discomfort. The duration of the disease extended over a period from one to ten years, covering a number of attacks from two to twenty or thirty. When the number of relapses was fewest, their character has been unusually severe and followed by protracted convalescence. Two cases were practically disabled from the occurrence of the first attack, every effort to move about being attended with pain and some digestive disturbance, and progressive loss of flesh and strength. In brief, all cases presented features of a chronic inflammation of the appendix with relapses.

The condition of the appendix varied much. In all cases but one inspection demonstrated the existence of chronic inflammation of all the coats, as shown by abnormal thickening and stiffness of the tube. Adhesions of varying density fixed the appendix in different situations; behind the cæcum or in the iliac fossa, in five cases; to the anterior abdominal wall, with the help of the omentum, in two cases; to the cæcum itself, or the ileum, in four cases; and once its

tip was free. Change in the axis of the appendix was noted in five instances, it being sharply bent on itself, besides being adherent. Ulceration of the mucous membrane was noticed at the site of the bend in one case. In two cases there was a decided constriction and dilatation beyond the bend, and four presented perforations, with the same number of small purulent collections. But only one faecal concretion was found. Once the lumen was entirely obliterated. In only one instance was the caecal end occluded.

All but one of the patients were men. Eight were between twenty-five and forty years of age; two were under twenty; two were over forty. One died from general peritonitis referable to infection from a small pus focus found behind the caecum, which was cleaned and disinfected, but not subsequently drained. In the remaining eleven cases all symptoms disappeared, and the patients were relieved from discomfort and anxiety.

The author believes that patients are in more danger from the continuance of the disease than from the operation performed in the quiescent period. He prefers to explore the appendix by an oblique incision, beginning about an inch above the middle of Poupart's ligament and extending three or four inches upward and outward.

Adhesions must be torn through with care, and cut only when very dense. The caecum, when freed from adhesions, can usually be rolled over inside the cavity and retained in different positions with sponges, so as to present all its aspects. It is undesirable and rarely necessary to pull it above the level of the edges of the wound. The appendix, recognized sometimes by touch only, is freed and ligated a quarter of an inch from the caecum with two catgut ligatures, and cut between them. Another ligature embraces whatever exists of its mesentery. It is removed by cutting through the mesentery beyond this ligature. The caecum is wedged about with sponges, the ligature removed from the appendix stump, the mucous coat pulled out with a hook, and its lumen constricted with a fine silk suture or ligature. The peritoneal coat is to be pushed back from it, and the tied tip pushed back (inverted) into the lumen of the caecum. This inverts

the peritoneal coat as well, and three or four Lembert sutures of fine silk through the adjacent wall of the cæcum close the circular opening in a longitudinal direction. This is the most perfect method of disposing of the appendix stump. It is not always feasible, because of the thickness and cohesion of the coats. Under these circumstances the stump may be ligated with catgut, then depressed, and the cæcal walls closed over it with Lembert sutures. Use may be made of adjacent bits of meso-appendix or omentum, secured by catgut sutures to make this closure more effective. Iodoform should be dusted along the suture line. All bleeding must be stopped. A tent of iodoform gauze is to be used only when pus has been encountered. The abdominal wound should be sutured in layers, one each of catgut through the peritonæum and aponeurosis, the other of silk-worm gut through all the layers except the peritonæum.—*Medical Record*, March 18, 1893.

**XI. The Question of Operation for Relief of Relapsing Typhlitis, with Report of Fourteen Cases.** By F. TREVES (London). The author, after discussing the anatomical conditions found in the great majority of cases of typhlitis, which he ranks under the four heads of: (1) moderate torsion of the appendix; (2) external torsion of the appendix; (3) lodgment of a foreign body in the appendix, and (4) primary ulceration of the appendix, discusses briefly the clinical manifestations of the disease, and closes his paper with details of fourteen hitherto unpublished cases in which he has operated for the relief of relapsing cases. These cases are preceded by the following summary of his views and practice in such cases: He thinks that the circumstances which would justify an operation in these cases must be precisely defined. It cannot be too emphatically stated that, in a fair proportion of instances in which the trouble has relapsed, no surgical interference is called for.

He is aware of many cases in which a patient has had three or more attacks of typhlitis, and has then ceased to be troubled with further outbreaks. In some examples of the relapsing form much

can be done by medical means, by diet, by attention to the bowels, and by placing the patient under conditions more favorable to a state of peace within the abdomen.

The operation alluded to consists, it is needless to say, in the removal of the offending organ—the appendix. He first proposed this operation, which should be carried out during a quiescent period, in 1877, in a paper read before the Royal Medical and Chirurgical Society. Since that date the procedure has been performed in a great number of cases and not always with proper discrimination.

The following are the more important circumstances which would justify an operation, and in all the cases with which he has dealt one or other of the subjoined conditions has been present.

(1) The attacks have been very numerous (in one case there had been nineteen relapses).

(2) The attacks are increasing in frequency and severity.

(3) The last attack has been so severe as to place the patient's life in considerable danger.

(4) The constant relapses have reduced the patient to the condition of a chronic invalid, and have rendered him unfit to follow any occupation.

(5) Owing to the persistence of certain local symptoms during the quiescent period there is a probability that a collection of pus exists in or about the appendix.

He has never operated in any case in which he has not been able to make out the enlarged appendix still in evidence after the acute symptoms have passed away.

It may be safe to argue that the pain and distress involved by the operation will be less than that attending any but a slight attack, and that the risk of the procedure is less than that associated with an outbreak of typhlitis considered generally. In none of the cases in which he has removed the appendix during a quiescent period for relapsing typhlitis has the patient done other than make a sound recovery.

*The Details of the Operation.*—The procedure is carried out

during a quiescent period, and after all the acute symptoms have subsided. The position of the appendix must be made out, and upon its site the place of the incision will, to a great extent, depend. In the larger proportion of cases an oblique inguinal incision answers well. An imaginary line is drawn from the anterior superior iliac spine to the umbilicus. The incision is about two inches in length, is placed at right angles to this line, and at a point about two inches from the spinous process. The centre of the incision corresponds to the line. The abdominal cavity is opened, and the appendix is exposed. Adhesions are dealt with in the usual way. If the little process be found to be very closely adherent to such a viscus as the ileum or bladder it is better to cut it off close to its attachment, and then to pare away the fragment still left adhering.

In dealing with the appendix it is well, whenever possible, to make a circular cut through the peritonæum just on the distal side of the spot at which it is intended to sever the process. The peritonæum thus freed is turned back, as is the skin in a circular amputation. The appendix is cut across at the line of the reflected peritonæum. The mucous membrane which presents is scraped away with a sharp spoon. The muscular wall of the appendix is then brought together by means of a continuous suture of No. 1 silk braid. Over the stump thus formed the reflected peritonæum is drawn and secured in place by means of a few points of Lembert's suture. It is needless to say that this procedure is not always possible. The tube may have to be occluded by means of a single ligature, but an attempt should always be made to give to the stump a covering of peritonæum. If the appendix be cut off close to the cæcum, it is sometimes possible to cover the divided end with a flap of peritonæum drawn from the cæcum. In other instances the serous covering required may be derived from that lying over the iliac fossa. In only one instance has he ever found a drainage tube necessary. In two cases, both of which have been already published, he failed to remove the process. The wound in the parietal peritonæum is finally brought together by means of a continuous suture of No. 1 silk braid passed with a

milliner's needle. The rest of the wound in the parietes is closed by silkworm gut sutures. The patient should remain in bed for a full period of twenty-one days.—*British Medical Journal*, April 22, 1893.

## **XII. An Analysis of Sixty-eight Cases of Appendicitis.**

By GILBERT BARLING, F.R.C.S. (Birmingham). The author has collected and examined all the cases diagnosed as typhlitis and perityphlitis or appendicitis admitted into the General Hospital, Birmingham, during a period of seven years, beginning in 1885. The total is sixty-eight cases—some of them so mild as to recover in a few days, others requiring weeks, and even then relapsing, a few with well-defined suppuration, and several of the fulminating kind; some of these last perfectly moribund when admitted.

Of the sixty-eight cases seven died, a mortality of 10.3 per cent. In forty of the sixty-eight, well-marked tumor was palpated in the right iliac fossa; in some of the others tumor probably existed, but the tenderness was so extreme that muscular resistance prevented a thorough examination. With regard to this absence of tumor, it is worth noting that in the most acute perforative cases tumor is only once mentioned, but these were nearly all late cases with distension and extreme tenderness, so that the obstacles to examination were unusually great. Another and rather remarkable point illustrated is that of the forty cases with tumor only four had well-marked abscess; all the others with one exception, a relapsing case operated on, recovered without suppuration. Only twice were redness and œdema noticed—once in a case which recovered without suppuration; in the other, a perforation of the cæcum, there was a well-formed abscess. In three out of the four patients with well-defined abscess of considerable extent, these two characters, redness and œdema, were absent. In two of the four abscesses fluctuation could be detected; in the two others it could not, the reason being, as operation showed, the extremely dense thickening of the abdominal wall over the pus collection.



The proportion of cases which relapse has been most variously estimated; of the sixty-eight patients here under consideration, five relapsed, three of them twice, one three times, and one four times. Of course, some others may have relapsed and found their way to other institutions, but one's general experience of acute conditions such as this is that the patient returns if he feels ill again.

Of those who relapsed, five in number, four eventually recovered to all appearance completely; the fifth was operated on and died. Of his case it is only right to say that the operation was done some years ago, before the modern procedure was formulated, and that under the same conditions now the result would probably be a more fortunate one.

The cases dying, seven in number, form the most interesting group in the statistics. One, a youth, aged seventeen, had a perforating ulcer of the cæcum setting up suppuration, the abscess subsequently bursting into the general peritoneal cavity and causing death. This case occurred in 1885, and has already been put on record. It is reasonable to say of it that at the present time it would certainly be operated on with every expectation of success.

In the remaining six patients the appendix was the starting point of disaster. One of them has already been referred to as a relapsing case. He was operated upon before the modern operation had been formulated, and no abscess being discovered, the incision was closed, except an exit for a drainage tube. Death occurred from peritonitis, and at the necropsy the appendix was found rather dilated, and containing three small concretions. In the remaining five cases the appendix was perforated, but in only one instance was there a concretion. All the patients were males, and their ages were respectively 12, 15, 19, 24, 30 and 35. All died from peritonitis, one due to the rupturing of a small abscess cavity; in the other instances the septic mischief appears to have spread directly from the inflamed appendix. In three cases out of the five the patients were admitted with advanced general peritonitis, without any very distinct evidence as to its starting point, and although section was performed on them, twice in the



middle line and once over the right iliac region, the peritonitis was too advanced for any hope of a successful issue. In one of the cases remaining there was a basic empyema, and practically no evidence pointing to the condition of the appendix; in the fifth and last, the symptoms were those of mild peritonitis, without any evidence pointing to the cæcal region as its starting point.—*Brit. Med. Jour.*, April 22, 1893.

#### EXTREMITIES.

**I. Rupture of the Patellar Attachment of the Left Quadriceps Extensor Cruris.** By J. W. BAWDEN, M.D. (London). A man, aged sixty-nine, slipped, falling backward with his leg under him, and, although he had no pain was unable to rise or to straighten his leg. Examination demonstrated that the patella and its ligament hung loose under the integuments. The extensor muscles were retracted, leaving a space of about three inches between the upper edge of the patella and the sharp lower end of the ruptured muscular attachment. The limb was treated by extending it to the utmost, then pulling the skin downward over the knee, at the same time pressing the patella upward as far as possible, and strapping it into position with plaster; next, the ruptured muscles were treated in the same manner, and the parts brought together as nearly as possible. The limb was then flexed sufficiently to be comfortable, fixed on a back splint, and swung from a cradle; the space between the torn edges of the tendon was now but about half an inch. After three weeks the straps were removed, but applied again for two weeks more. The joint was then supported in plaster-of-Paris for a month, after which a leather knee-cap was worn. The patient recovered good use of the limb, limping slightly only. The author considers hypertrophy of the muscles and bones of the knee due to the patient's occupation, with later muscular degeneration, to be the predisposing cause of the accident.—*London Lancet*, February 11, 1893.

## II. Injury of the Anterior Tibial Artery Complicating Compound Fracture of the Leg.

By A. PEARCE GOULD, F.R.C.S. (London). Commenting upon the paucity of the literature of injuries of main vessels complicating fractures, the author relates the case of a man, aged fifty-two, whose leg was broken by a cart wheel passing over it. There was a compound oblique fracture of the right tibia and fibula, a little below the middle of their shafts. It was treated antiseptically, but on the eleventh day, fluctuation being detected over the inner surface of the tibia, an incision was made, and about two ounces of blood clot turned out. Two days later acute hæmorrhage from the wound occurred; the posterior tibial artery was pulsating at the ankle, but no pulsation could be detected on the dorsum of the foot. With a diagnosis then of hæmorrhage from the anterior tibial artery, a free incision was made, and the lower end of the vessel easily found and tied with kangaroo tendon in the lower part of the wound; the upper end, widely separated from the lower, was found with considerable difficulty, and also tied. The anterior tibial nerve had also been divided by the injury, but its suture was not attempted. On account of the extreme swelling of the limb the wound could not be sutured. A small loose bit of bone was removed from the wound, and an alembroth wool dressing applied. The patient made a good recovery, with a sound, straight leg, and but little stiffness of the knee and ankle joints. The author remarks in connection with the case that the hæmorrhage was due not to septic arteritis, but to traumatism; the escaping blood being at first only moderate, but on breaking out afresh becoming very profuse. To have ligatured the popliteal artery would have unnecessarily cut off the direct supply of blood to the part through the posterior tibial artery, and the tension of the leg was so great that it was doubtful if the anastomotic circulation could have been established. To tie the bleeding artery where wounded offered the advantage of an assured arrest of the bleeding without any additional interference with the arterial supply to the foot, the relief of tension by the evacuation of the effused blood, and the hastening of the repair by the same means.

Attention has been called to the difficulty of finding the artery when the usual landmarks are lost. Not much difficulty was experienced in the present case, chiefly because of the free incision down to it, although the author thinks that the difficulty of the procedure has been exaggerated. Amputation should be entirely abandoned as a routine treatment for hæmorrhage in compound fracture, only being justified by some additional special circumstance, such as failure to secure the bleeding vessel or extensive septic infection of the tissues of the limb. He formulates his views on the subject as follows:

(1) In primary hæmorrhage the bleeding vessel should be sought for in the wound and, if possible, both ends ligatured. For this purpose the wound may require to be considerably enlarged. If, after a free exposure of the wound and a careful search, the bleeding vessel cannot be found, amputation is necessary.

(2) In non-septic secondary hæmorrhage the same rule should be followed.

(3) In secondary hæmorrhage from septic arteritis, if the suppuration is limited in area the bleeding vessel should be sought in the wound, and a ligature placed on it some little distance above and below the aperture in it, and the most careful means employed to make and keep the part aseptic. Should the hæmorrhage recur the main artery may be ligatured. Should this fail to arrest the bleeding, or should the septic suppuration in the first place be very extensive, amputation above the seat of fracture is indicated.—*London Lancet*, March 4, 1893.

JAMES E. PILCHER (U. S. Army).

#### GENITO-URINARY ORGANS.

**I. Cases of Nephrectomy, with Remarks.** By Dr. M. H. RICHARDSON (Boston). The author reports four successful nephrectomies, two for tuberculosis, one for adenoma and one for hydronephrosis, caused by an impacted calculus in the ureter.

In approaching the kidney, the author selected in all an anterior incision in the linea semilunaris. He was influenced to select this

route on account of the easy and complete exposure of the kidney which it gives, and the opportunities for the complete and ready control of hæmorrhage which it offers ; it, moreover, enables the operator to ascertain the state of the other kidney, or of other organs. He considers removal of a kidney by the lumbar path to be a very difficult and dangerous procedure, involving hazard from hæmorrhage alone exceeding the immediate and remote dangers of the whole operation by the anterior route. He calls attention to the dangers of tearing the renal vein, the difficulty in tying the pedicle, and the frequency of multiple branches from the abdominal aorta going to the kidney.

By the anterior incision the peritoneal cavity is at once opened. On the right side appears the ascending colon, which may be easily turned one side, and come down directly upon the kidney. On the left side the descending colon passes in front, and at times its mesentery is spread over the anterior surface of the tumor. Separation is very easy, however, and may be accomplished without danger to the large vessels of the meso-colon, especially if the kidney is not much enlarged. By first separating the attachments of the colon on either side at the outer edge, and pushing the whole toward the median line, all danger of injury both to the bowel and its vessels may be avoided. By this route the kidney may easily be isolated and its attachments secured, the important structures meantime being easily accessible in a well-lighted field.

On separating the kidney, the pedicle should be tied in sections with the greatest care, not using too large silk. Having tied the pedicle in sections with small silk, and being sure that each ligature is firm, it is a good plan to apply a ligature of larger silk around the whole, fastening it with the greatest care. In this manner the danger of hæmorrhage is very slight. In the tubercular cases he used gauze packing, and where there was much oozing the gauze drain.

In one case he sewed the ureter in the wound. In all the other cases he tied, cauterized and left it. All the cases did equally well, and there seems to have been no difference in the result by any of

these methods. In tuberculous and inflammatory cases he advises packing the whole cavity with dry sterile or iodoform gauze. He prefers, in closing the wound, to use silver-wire sutures in this as in all parts of the body. In almost all cases there is no suppuration whatever. Sterilization is much more easy and perfect than in the use of silk.—*Boston Medical and Surgical Journal*, April 13, 1893.

**II. A Case of Total Ablation of an Ureter for Persistent Purulent Inflammation of the same, remaining after Nephrectomy for Pyonephrosis.** By Dr. PAUL REYNIER (Paris). The reporter records the case of a man, of twenty years, whose right kidney, which had become converted into a large pus sac, he enucleated through a lumbar incision in April, 1892. The much dilated ureter, of the calibre of the small intestine, was at this time also dissected out for some distance, and after having been ligated the separated part was cut away. The lumbar wound healed promptly, but the urine persisted in remaining purulent, and when the ligature that had been thrown around the ureter came away a pus-discharging fistula remained. Two months later the lumbar wound was reopened and enlarged, the stump of the ureter identified and liberated from its cicatricial adhesions, and by a finger following it down and enucleating it, some 15 centimetres had already been drawn out when the tube tore across and the stump retreated deep into the pelvis, the part that was removed being more than 12 centimetres long. After this the same condition as before again developed. Ten days later an attempt was made to reach the lower end of the ureter through the perinæum by an incision running from the median line back to the level of the coccyx. The side of the rectum and the prostate were readily exposed, the vesiculæ seminales and the bas fond of the bladder were identified, but it was impossible for him to discover or to feel the ureter, notwithstanding prolonged and minute search. Four months later the condition of the patient remained unchanged, and he suffered much from pain and tenderness in the right flank. Reynier now essayed again to reach the lower

end of the pus-secreting ureter through an incision in the inguinal region. The bladder was first distended with boric acid solution, and raised up by a ball in the rectum; by incision the inguinal canal was now opened up, and the peritonæum was stripped up as if for the ligature of the iliac artery, as far as the point where the vas deferens crosses the iliac vessels. His search for it here was at first in vain, but at last he found it concealed by the retractor which held back the peritonæum, with which it had been lifted up. It was easy then to isolate what remained of the ureter throughout its whole extent, which was now about 12 centimetres. Its upper part, where torn at the previous operation, was closed; its cavity, still like that of an intestine, contained pus, which could be pressed on into the bladder; as it approached the bladder it regained its normal dimensions. It was easy to isolate the ureter from the fatty tissue by which it was surrounded down to the point of its entry into the bladder, and here to ligate it and cut it off. The ligature thread was brought out through the incision in the groin, a drain put in place, and the inguinal wound was closed as in operations for hernia. The aftercourse of the operation was very simple. From the day but one thereafter no pus appeared in the urine; after a few days, with the help of a few capsules of oil of sandalwood, the urine became perfectly clear; as soon as the ligature came away the groin wound promptly closed, the local pains disappeared, the patient regained his health and was able to resume his trade.

The reporter believes this to be the first instance in which such ureterectomy has been done, but thinks that the occasions for its practice will not be infrequent. He is of opinion that those authors who have stated that after nephrectomy any lesions of the ureter may be expected to spontaneously disappear, will often be found to be in error, and that, on the contrary, in many cases interminable fistulæ persist, which call for later removal of the ureter in order to bring about final cure.

For such ureterectomy he advises the last method of operating adopted in his case. The incision of inguinal canal and the stripping up of the peritonæum as far as the iliac vessels opens a path wide



enough to allow of the isolation of the ureter as far as the bladder. By taking the vas deferens as a guide, the operator readily directs himself and reaches the ureter in its pelvic portion either at the point where the ureter crosses it, or a little above this point where the vas deferens crosses the vessels. One may also be helped by remembering that the ureter may be found at the intersection of a line drawn transversely between the two anterior superior iliac spines and one drawn vertically through the spine of the pubis.—*Bull. et Mém de la Soc. de Chir. de Paris*, March, 1893, p. 102.

**III. Suprapubic Prostatectomy.** By G. BUCKSTON BROWNE, F.R.C.S. (London). In a paper read before the Medical Society of London, the author remarks that in prostatic obstruction the intra-vesical enlargement is the chief cause of difficulty in micturition. The intra-vesical growth is often like an egg, projecting into the bladder, with the vesical urethral orifice at the apex of the egg. This ovoid projection may be deficient at any part of the urethral circumference. When wanting anteriorly and laterally, there is the so-called middle lobe enlargement, in which from behind the urethral orifice there is a projecting prostatic mass acting like a bullet-valve, and often causing the bladder to be entirely dependent upon catheterism for evacuation of urine. More rarely the ovoid projection is wanting only in front or only on one side, in which cases it is nearly always with a posterior enlargement. Intra-vesical prostatic outgrowths may be associated with considerable extra-vesical enlargement, and the latter may exist without the former and cause the patient so afflicted to be partially or completely dependent upon his catheter. The author believes that the intra-vesical growth alone can be removed with reasonable safety and with a fair prospect of recovery of the power of natural micturition. Urethrometers and electric endoscopes are dangerous from their liability to induce urethral fever, but digital rectal examination and the careful measuring of the length of the urethra by the simple passage of the catheter are simple and serviceable. Any undue length of the urethra would be an argument in favor of intra-vesical hypertrophy, emphasized if rectal examination



shows prostatic enlargement. If the urethra is nine inches long or more, there is almost sure to be intra-vesical growth, even if not much can be felt by the rectum. Adverting to the otherwise incurable nature of retention from prostatic hypertrophy, he advises regular catheterism as long as possible. The operation for removal of the obstruction should always be extra-peritoneal, since the danger would be vastly increased if the peritonæum be involved, and the former is ample for all purposes. The bladder should always be opened upon a staff, otherwise the very large body of the prostate is liable to be incised instead of the bladder. The projecting prostate should be twisted off with forceps, in one piece if small, piecemeal if large; the torsion diminishes hæmorrhage. Hæmorrhage is usually very free, and all the more so if the knife or scissors have been used on the prostate, and the use of both these instruments is deprecated. The author has found hot water irrigation sufficient to control the bleeding. Only the intra-vesical growth should be attacked. No good would come of an attempt to remove the lateral lobes even in part. In cleaning the vesical urethral orifice of all surrounding projecting prostatic tissue much assistance is obtained from the presence of a metal sound in the urethra.

He concludes with the opinions that: (1) Supra-pubic prostatectomy should never be undertaken at the outset of catheter life unless auto-catheterism is impossible; (2) The operation should never be undertaken as long as the ordinary catheter life is a tolerable one; (3) If from any causes catheter life becomes intolerable, supra-pubic prostatectomy should be resorted to. By this procedure the bladder can be thoroughly explored and every stone removed, such as in these cases might easily have escaped detection by the more usual methods of examination. The intra-vesical growth, if it is found to exist, can be fully examined and removed if the operator wishes. If removal is deemed inadvisable, or there is nothing to be removed, he can leave the patient with a suprapubic tube for permanent after-wear, with the certainty that he will have materially improved the condition of the patient; (4) Should the operator decide to remove the prostatic obstruction, there is a very good prospect, but not a

certainly, of the power of natural micturition being restored to the patient.—*London Lancet*, March 11, 1893.

JAMES E. PILCHER (U. S. Army).

**IV. Suprapubic Cystotomy.** By F. A. SOUTHAM, F.R.C.S. (Manchester). The author has during the past seven years performed suprapubic cystotomy seventeen times for four causes—tumor, prostatic retention of urine and cystitis—as follows:

No.	Age	Condition.	Nature of Operation.	Result.	Remarks.
1	41	Tumor—papilloma.	Removal of tumor.	Recovery.	
2	58	Tumor—papilloma.	Removal of tumor.	Death.	Acute septicæmia. Death on tenth day.
3	8	Calculus.	Lithotomy.	Death.	Bladder sutured; leakage of urine; pelvic cellulitis.
4	46	Cystitis, tuberculous.	Drainage.	Death.	General tuberculosis. Death from exhaustion on second day.
5	67	Tumor—papilloma.	Removal of tumor.	Death.	Acute peritonitis. Death on third day.
6	35	Tumor—epithelioma.	Drainage.	Recovery.	Drainage through suprapubic fistula six months subsequently.
7	62	Retention of urine due to malignant prostatic disease.	Drainage.	Death.	Death from exhaustion on second day.
8	66	Retention of urine due to hypertrophy of prostate.	Prostatectomy.	Recovery.	Recovered power of voluntary micturition.
9	69	Retention of urine due to hypertrophy of prostate.	Prostatectomy.	Recovery.	Recovered power of voluntary micturition.
10	18	Calculus of large size.	Lithotomy.	Recovery.	
11	49	Calculus, encysted.	Lithotomy.	Recovery.	Prostatectomy also performed.
12	63	Calculi, three in post-prostatic pouch.	Lithotomy.	Recovery.	Prostatectomy also performed.
13	56	Tumor—papilloma.	Removal of tumor.	Recovery.	
14	52	Retention of urine due to stricture and hypertrophy of prostate.	Drainage.	Recovery.	Recovered power of voluntary micturition.
15	52	Calculus in post-prostatic pouch.	Lithotomy.	Recovery.	
16	38	Calculus in post-prostatic pouch.	Lithotomy.	Recovery.	
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As a result of his experience in Cases 1, 2, 5, 6 and 13, the author concludes that for all cases of removal of vesical growths occurring in males there is no doubt but that the suprapubic operation is far superior to perineal cystotomy. It also possesses great advantages as a means of exploring the bladder for diagnosis of growths. If removal is not desirable, drainage is established best by this route, as in Case 6.

From the experience of Cases 3, 10, 11, 12, 15 and 16 he concludes that the cutting operation is justified only when crushing is contraindicated by the size and hard nature of the stone, or by the fact that it is encysted or associated with considerable enlargement of the prostate gland. In this connection he remarks at length in favor of the crushing operation.

From the experience of Cases 7, 8, 9, 14 and 17 he concludes that suprapubic cystotomy is indicated in habitual retention due to enlargement of the prostate: (1) when palliative treatment—regularly drawing off the urine and washing out the bladder—has failed to give relief, and when self-catheterism is impracticable or attended by pain; and (2) when the retention is accompanied by active hæmorrhage into the interior of the bladder, which cannot be checked by ordinary means. Under these circumstances the operation enables one of the following courses to be adopted: (*a*) free drainage for a time, which is often followed by a return of the power of voluntary micturition; (*b*) permanent drainage by the establishment of a suprapubic fistula; and (*c*) removal or division of the obstructing portion of the prostate gland.

In cystitis (Case 4) the operation is not only useful as a means of effectually draining and irrigating the bladder, but it also affords access to the ulcers, which may be scraped or cauterized.

He remarks that in Cases 2, 3 and 5 the fatal result was due to septicæmia, pelvic cellulitis and peritonitis, complications now almost certainly preventable if during the operation the cellular tissue in front of the bladder is not much disturbed, and if during the after-treatment the wound is kept in an aseptic condition. He thinks the

opening in the bladder should never be sutured; it adds a danger to the operation, for if the bladder begins to leak after the superficial wound has entirely or partly closed (Case 3), extravasation and pelvic cellulitis are likely to occur; if, on the other hand, the suturing is successful, the operation is deprived of one of its chief advantages—the free after-drainage—which is always beneficial.—*London Lancet*, March 18, 1893.

#### ABSCESSSES.

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#### BONES, JOINTS—ORTHOPÆDIC.

**I. Tuberculous Disease of the Elbow Joint.** By Dr. KOSIMA (GOETTINGEN). The writer has made a study of the material which has accumulated in the Goettingen Surgical Clinic during the last fifteen years. It consists of twenty-one cases treated

conservatively, and 115 which were either resected or amputated. Fifty-four per cent. involved the right, and 44.5 per cent. the left arm, while only 1.5 per cent. implicated both articulations. Forty-six per cent. were males, and fifty-four were of the female sex, while in other tuberculous diseases the males usually predominate. As to etiology, in 41.5 per cent. tuberculosis of the skin, lungs, glands, etc., had preceded, in 12 per cent. it followed an injury, in 40.5 per cent. the origin was obscure, the patients being apparently healthy. Hereditary involvement was found in only 6 per cent. In the majority the disease began in the first twenty years of life (45 per cent.), but not rarely in middle life, *i. e.*, between the twentieth and fiftieth years, while at the ages of fifty to seventy only 20 per cent. was observed. Twenty-two per cent. had passed the fiftieth year. The course of the disease is chiefly very chronic, and in more than the half of the cases it comes to the formation of fistulae, sooner or later. These appear posteriorly either between the radius and ulna, or behind the internal condyle. The affected arm is contracted in a right-angled position, and is in some cases ankylotic. The disease may attack the synovial membrane or the bone, or be from the first a mixed form. Tuberculous dropsy of the joint is much rarer than in the knee joint. Among the cases operated on 71 per cent. were osteal, involving chiefly the humerus, most rarely the radius. Injection with a solution of iodoform in glycerine was, in two cases, without results; the plaster-of-Paris bandage gave the same result. Resection was performed ninety-four times after Langenbeck's, and fourteen times after Koenig's method. In eight cases, on account of destructive implication of the joint, amputation was necessary. In Koenig's method the olecranon, and a large portion of the epicondyles are saved. Iodoform is dusted in and rubbed into the resected articulations, the arm placed in extension and supination for three or four weeks, before any flexion is attempted. In general, resection gives the best results, for 60 per cent. of the cases had, with more or less mobility, a serviceable arm, 33 per cent. remained ankylotic, without entirely losing the use of the member. Koenig's method is more frequently followed

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by ankylosis than that of Langenbeck. In 74 per cent. the operation ran an aseptic and an afebrile course; in 3 per cent. the result was fatal (one death from iodoform intoxication, a second from pneumonia, a third from diphtheria, and the fourth from pulmonary tuberculosis). Later, twenty-five of those operated on died from their tuberculosis in other organs; of these ten were cured of tuberculosis of the elbow joint, five retained suppurating fistulae. The result in the other ten was undetermined.—*Deutsche Zeitschrift fuer Chirurgie*, Bd. xxxv, Heft. 1-2.

**II. Treatment of Tuberculous Coxitis by Injections of Iodoform.** By C. BUNGER. The writer regards injections of iodoform as a step forward in the management of surgical tuberculosis, yet the results seem to be less favorable in tuberculous disease of the hip joint. This is due to the faulty technique. He declares Krause's method to be insufficient, and to require certain positions which, in the stage when the iodoform injections are indicated, to be difficult of execution. He recommends the following method, which has been used by Kuester for several years: One determines by palpation the place where the femoral artery crosses the pubic bone, and introduces the instrument at the inner border of the Sartorius, and on a line drawn from the femoral artery to the trochanter major, directly into the joint. At this place one can often in lean individuals feel the head of the bone, and it is indeed the shortest and most direct way into the joint. Lesion of the vessels and the crural nerve is thus avoided, as they lie more toward the median line. A series of experiments upon the cadaver has demonstrated the advantages of this method. In all cases, on opening the joint the injected substance was not only spread over the synovial membrane, but also diffused over the head of the femur and acetabulum, *i. e.*, there where the osteal foci are usually found. Done after Krause's method the injection in some cases did not gain the joint at all, and, in the majority, was found to cover but a portion of the articulation. With this modification he hopes for better results in the treatment of tuber-

culous coxitis. Instead of the long trocar used by Krause he prefers a hypodermic syringe containing about two and a half grams, with a tip some five to seven centimetres in length. As an injection he uses a 20 per cent. solution of iodoform in glycerine, which he injects every eighth to fourteenth day.—*Centralblatt fuer Chirurgie*, No. 51, 1983.

FRANK H. PRICHARD (Norwalk, Ohio).

### III. Hoffa's Operation for Congenital Luxation of Hip.

By Dr. DENNÉ. A girl, five years of age, presenting the characteristic gait of congenital luxation of the hip. The total shortening of the left lower limb was  $5\frac{1}{2}$  cm., 3 of which are attributed to the riding up of the femur. There exists a primitive lumbar scoliosis with a compensation curve in the dorsal region.

An incision of 7 cm. parallel to the axis of the great trochanter and up to 3 cm. above it was made. The muscles were divided in the direction of the fibres of the gluteus maximus, displaying the thickened capsule. This was cut open longitudinally from one end to the other. The head of the femur was now seen, flattened from behind forward and somewhat elongated from above downward. The round ligament was missing, as well as the neck, and the head seemed directly applied on the femoral diaphysis. The anterior muscles, the pyramidal, the internal obturator and the gemelli were retracted. A cartilaginous lamella, very small, containing all the tendinous trochanter insertions, was detached from the great trochanter with a strong blunt bistoury. The head could then be drawn down by traction much better.

The cotyloid cavity was small and triangular, readily admitting the extremity of the index finger. The soft parts were removed, incision made to the bone in front, downward and backward. This detachment of the cellulo-fibrous tissue from the bone was the most intricate and delicate moment of the operation. The exposed cotyloid cavity was still too narrow to receive the femoral head. The lower half circumference of this cavity was enlarged with a fenestrated

gouge, hollowing it out to increase its depth. The two cartilaginous pieces with the muscular insertions are then fixed on the head with a few catgut sutures, and all is ligated to the capsule. A sort of bridge is thus formed above the head to give it support. The capsule is sutured with catgut, leaving open only a small orifice for a thread-like drain. The skin is sutured with horse hair. A large T-shaped plaster bandage grasps the pelvis with its horizontal branch, and winding around the lower limb down to the middle of the calf holds the thigh in abduction. Extension with five pounds of weight and counter-extension by raising the legs of the bed is employed.

The temperature rose on this evening to 38° C., on the following evening to 39° C., but it soon fell. The dressing was left in its place for about three weeks; the wound cicatrized.

The movements are free; the great trochanter is on a level with Nélaton's line. The retraction is equal to  $2\frac{1}{2}$  cm.—*i. e.*, just the difference of real length between the two limbs.

Traction is continued with a weight of four pounds, massages every day; also more and more extended movements. The child still walked on crutches when she left the hospital. A year afterward lordosis had disappeared, but there remained a certain degree of scoliosis. The measurement of the two lower limbs gave a difference of a little less than 3 cm.; that of the different segments of the lower limb showed nearly 1.8 cm. against the limb operated on.—*Bulletin et Memoires de la Société de Chirurgie de Paris*, February, 1893.  
SAMUEL LLOYD (New York).

#### GYNÆCOLOGICAL.

**I. Symphysiotomy at the Clinique Baudelocque.** By A. PINARD, M.D. (Paris). In a clinical lecture, reported in English by Dr. J. B. Henderson, the author reviews his experience with symphysiotomy during the year 1892. Thirteen cases were subjected to operation by him and his assistants as follows:

Number.	Age.	Previous Labors.	Measurements.	Early History of Present Labor.	Operation and Result.	Fetus.
1	32	1	Pelvis canalicular, promonto-subpubic diameter, 9.7 cm.	Hydramnios, large mobile fetus; expulsion impossible.	Spontaneous separation after symphysiotomy of 1 cm.; extraction by the feet—head by Champetier's method—effected in fifty-five minutes. Parts sutured and fixed by a plaster dressing. Patient rose on twenty-first day, and made a complete recovery.	Weight over 7 lbs.; apparently dead, but resuscitated; died on third day from meningeal hemorrhage.
2		0	Pelvis flattened.	In labor for twelve hours; forceps unavailable; presentation vertex in left transverse diameter.	Symphysiotomy (nineteen minutes) gave separation of 1 cm., increasing on separation of thighs to 3 cm. Forceps extracted easily in four minutes, the separation of the pubes reaching 6.1 cm. Rose on thirty-third day, and made complete recovery.	Weight over 10 lbs.; occipito-mental diameter, 14.3 cm.; occipito-frontal, 12.7 cm.; suboccipito-bregmatic, 10 cm.; suboccipito-frontal, 11.3 cm.; biparietal, 9.3 cm.; bitemporal, 8.7 cm. Child living a year later.
3	30	3	Pelvis annular. Promonto-subpubic diameter, 9 cm.	Presentation vertex first. Application of forceps unavailable.	Spontaneous separation after symphysiotomy (seven minutes) of 1 cm., increased by abduction of thighs to 4.8 cm. Forceps withdrew the fetus with a separation of 6.5 cm. Union by first intention; rose on twenty-ninth day, and recovery perfect.	Weight over 5 lbs.; occipito-mental, 12.7 cm.; occipito-frontal, 11.8 cm.; suboccipito-bregmatic, 10.4 cm.; suboccipito-frontal, 10.6 cm.; biparietal, 9.7 cm.; bitemporal, 7.9 cm.; submento-bregmatic, 9.5 cm. Apparently dead, but revived and now well.
4	26	3	Pelvis rachitic, annular. Promonto-subpubic diameter, 9.8 cm.	First labor terminated by embryotomy, and second and third induced at 8 months. Presentation vertex first.	Spontaneous separation after symphysiotomy of 3 cm. Forceps easily withdrew fetus with not more than 1 cm. increase of separation. Union by first intention; abscess of left labium magis; rose on twenty-sixth day, and made a perfect recovery.	Weight about 4½ lbs.; occipito-mental diameter, 15.4 cm.; occipito-frontal, 11.1 cm.; suboccipito-bregmatic, 9.3 cm.; suboccipito-frontal, 9.8 cm.; biparietal, 8.2 cm.; bitemporal, 7.5 cm. Died from inanition after two days.



Number.	Age.	Previous Labors.	Measurements.	Early History of Present Labor.	Operation and Result.	Fetus.
5	38	5	Pelvis annular. Promonto-subpubic ameter, 9.3 cm.	First confinement required basiotripsy; second and third induced prematurely; fourth and fifth, miscarriages. Presentation, vertex first.	Spontaneous separation after symphysiotomy of 2.5 cm. Child readily extracted with a separation of 4.5 cm. Union by first intention; rose on sixteenth day. Nursed the child. Cure complete.	Healthy child; weight, over 6 lbs. Occipito-mental diameter, 13.2 cm.; occipito-frontal, 11.5 cm.; suboccipito-bregmatic, 10 cm.; suboccipito-frontal, 10 cm.; biparietal, 9.1 cm.; bitemporal, 8.2 cm.
6	32	0	Pelvis generally contracted. Promonto-subpubic diameter, 9 cm.	Operation determined by palpation, measurement and exploration. Presentation, vertex first; labor induced.	Spontaneous separation after symphysiotomy (three minutes) of 3.5 cm. Easy extraction with increase to 6.2 cm. Union by first intention; rose on twentieth day. Cure complete.	Healthy child; weight over 5 lbs. Occipito-mental diameter, 13 cm.; occipito-frontal, 11 cm.; suboccipito-bregmatic, 10 cm.; suboccipito-frontal, 10.3 cm.; biparietal, 9.4 cm.; bitemporal, 8.2 cm.
7	23	0	Pelvis annular. Promonto-subpubic ameter, 10.4 cm. Height, 4 ft. 8 in.	Operation determined by palpation. Presentation, vertex first; labor induced.	Spontaneous separation after symphysiotomy (seven minutes) of 1 cm. Rather difficult extraction, forceps applied twice, with increase to 5 cm. Union by first intention; rose on twenty-fourth day. Cure complete.	Healthy child; weight over 7 lbs. Occipito-mental diameter, 13 cm.; occipito-frontal, 12.2 cm.; suboccipito-bregmatic, 11 cm.; suboccipito-frontal, 12 cm.; biparietal, 10 cm.; bitemporal, 9 cm.
8	26	1	Pelvis annular. Promonto-subpubic ameter, 9.7 cm.	Labor and forceps ineffectual.	Spontaneous separation after symphysiotomy by Dr. Lepage (thirteen minutes) of 26 mm. Easy forceps extraction with increase to 5 cm. Union by first intention. Recovery complicated by abscess of right labium majus; rose on thirtieth day. Cure complete.	Apparently dead; child resuscitated; weight nearly 9 lbs. Occipito-mental diameter, 13.1 cm.; occipito-frontal, 11.5 cm.; suboccipito-bregmatic, 9.8 cm.; suboccipito-frontal, 11.3 cm.; biparietal, 9.5 cm.; bitemporal, 8.7 cm.



9	1	Pelvis rachitic, annular; promonto-subpubic diameter, 9.2 cm.	Former labor ended with basiotripsy; 2 shoulder presentation; arm prolapsed. Operation determined by previous history.	Symphysiotomy by Dr. Varnier permitted separation of 3.5 cm. on abduction of thighs. Easy forceps extraction, with increase to 7 cm. Union by first intention, although a tear had been induced from vagina to symphysis. Rose on nineteenth day. Cure complete.	Healthy child; weight over 7 lbs. Occipito-mental diameter, 12.5 cm.; suboccipito-bregmatic, 9.8 cm.; suboccipito-frontal, 11.4 cm.; biparietal, 9.5 cm.; bitemporal, 8.5 cm.
10	25	Pelvis flat. Promonto-subpubic diameter, 10 cm.	Former labor complicated with twins and eclampsia. Presentation, vertex first. Forceps ineffectual.	Spontaneous separation after symphysiotomy (12 minutes) of 3 cm. Easy forceps extraction with increase to 4 cm. Union by first intention; rose on nineteenth day. Cure complete.	Healthy child; weight 7 lbs. Suboccipito-bregmatic diameter, 9.3 cm.; suboccipito-frontal, 10.6 cm.; biparietal, 9 cm.; bitemporal, 7.8 cm.
11	28	Pelvis rachitic, annular. Promonto-subpubic diameter, 10 cm.	Presentation, vertex first. Forceps ineffectual.	Spontaneous separation after symphysiotomy (12 minutes) of 3 cm. Easy forceps extraction with increase to 5.8 cm. Union by first intention; rose on twentieth day. Cure complete.	Healthy child; weight over 8 lbs. Occipito-mental diameter, 13.6 cm.; occipito-frontal, 11 cm.; suboccipito-bregmatic, 10.3 cm.; suboccipito-frontal, 11.5 cm.; biparietal, 9.5 cm.; bitemporal, 7.9 cm.
12	1	Pelvis annular. Promonto-subpubic diameter, 10.5 cm.	Presentation, vertex first. Fetus large. Forceps ineffectual.	Spontaneous separation after symphysiotomy by Dr. Wallich of 2.5 cm. on abduction of the thighs. First application of forceps slipped, the cord being prolapsed. Extraction on second application, with separation of 4.5 cm. Union by first intention; rose on the nineteenth day, but was seized with phlegmasia alba dolens, from which she still suffers.	Child apparently dead, but resuscitated. Weight, 8 lbs. Occipito-mental diameter, 13.5 cm.; occipito-frontal, 12.3 cm.; suboccipito-bregmatic, 10.4 cm.; suboccipito-frontal, 11.4 cm.; biparietal, 9.5 cm.; bitemporal, 7.5 cm.
13	38	Pelvis rachitic, annular. Promonto-subpubic diameter, 9.7 cm.	Cephalotripsy at previous labor. Presentation breech transverse formed by external version into occipito-iliac, right transverse.	Spontaneous separation after symphysiotomy by Dr. Potocki (nine minutes) of 3 cm. Forceps extracted fetus easily, increasing the separation to 5.7 cm. Union by first intention; rose on twenty-second day; still under observation.	Child apparently dead, but resuscitated, dying the next day. Weight over 7 lbs. Occipito-mental diameter, 13.6 cm.; occipito-frontal, 11.2 cm.; suboccipito-frontal, 10.7 cm.; biparietal, 9.5 cm.; bitemporal, 8.4 cm.

In each of the foregoing cases the only evidence of the operation is a small cicatrix, scarcely visible, in the middle of the pubic region; the pelvis is as firm as before the operation, and there is no trouble in micturating or in standing. The result as regards the foetus is equally encouraging, ten out of the thirteen surviving, and those lost dying from causes not incident to the operation.

The method of operating formulated as a result of the experience tabulated above, is as follows: All antiseptic precautions having been taken, and the surgical and obstetrical instruments prepared, the woman should be placed on her back near the side of a firm bed of moderate height, so that the median line, where the incision is to be made, may be commanded directly from above. It is best to stand between the thighs. An incision should be made in the median line (and exactly in this line) of the integuments and the prepubic tissue about 8 cm. long, stopping above the clitoris. The recti, in the upper part of the incision and immediately above the symphysis, should be separated in order to allow the index finger to penetrate into the prevesical cavity and protect the bladder. This finger not only protects the bladder, but it frees the pad of the symphyses—but not always, for this is often so very slightly prominent that it cannot be appreciated—and thus renders the section easy; as soon as the bistoury has penetrated into the symphysis, it is this finger on which its blunt point strikes, and that keeps a record of its progress down to the last fibres of the subpubic ligament. The finger being thus in the prevesical cavity, the symphysis must be incised from above downward, and from before backward, by many touches of the bistoury, allowing the latter to penetrate where it finds the least resistance. Immediately after cutting the symphysis, a complete section of the subpubic ligament should be made; for this section the precaution must be taken of introducing a sound into the urethra, so as to incline the latter down to the side; then the ligament must be attacked with caution by small cuts, as if cutting it fibre by fibre. The finger shows the progress accomplished, and, as a general rule, when the finger finds that only a few fibres remain like a small resisting cord, this cord breaks, and the spontaneous separation, which

had been only a few millimetres, suddenly increases to two or three centimetres. Careful abduction of the thighs will induce a further separation. The author insists that to insure the safety of the foetus this separation must increase to at least four centimetres, and has had a registering separator made for the purpose by Collin, the instrument maker. He absolutely rejects subcutaneous section from below upward and from behind forward, as well as incomplete section.

With regard to the obstetrical phase of the operation, he considers a vertex presentation the preferable. The application of forceps should be exact. The hand should be thoroughly introduced, so as to place the first blade in the middle of the preauricular region; if the head is not flexed, it should first be flexed with the hand. This being done, the other blade should be introduced without moving the first blade or the head. He emphasizes the necessity for an equal application of the forceps on a flexed head. After section of the symphysis he prefers not to trust to uterine contractions to expel the foetus, but to intervene promptly, and also not to delay the removal of the placenta more than a quarter of an hour. Immediately after delivery he washes out the uterus; when the water returns clear and the womb is well contracted, he introduces into the vagina iodoform gauze. After this he cleans the wound with a sponge and a 5-per-cent. carbolic solution, and proceeds to suture the soft parts. The symphyses being brought together into closer contact, he places four deep silver sutures—which touch the anterior surface of the pubis—and four superficial ones, and then covers the wound with iodoform and iodoform gauze. Then the legs being brought together and held in position by a bandage, the woman is placed in a special bed, which, by means of two lateral and concave cushions, enables the pelvic bones to be kept in constant apposition. Where this bed is not obtainable simple apposition of the legs with a well-applied trunk bandage very firm in the pelvic region, or a plaster bandage, would be sufficient. The sutures should be removed on the eighth day, and then the patient can turn in bed easily and without pain. He does not think it prudent for patients to get up until about the twentieth day.

The operation requires but few instruments: a firm and fine short-bladed bistoury and a probe-pointed bistoury are absolutely sufficient, but he recommends also a registering separator and a chain-saw, the latter for use in case of ankyloses. However, he states that in sections of 100 aged cadavers he never found ankylosis. He thinks it unwise to allow the separation to go beyond 7 cm., not so much from fear of producing lesions in the region of the sacro-iliac synchondrosis, as to avoid lesion of the soft parts in the region of the vulva, vagina and bladder.

He considers symphysiotomy destined to occupy a foremost place among obstetrical operations, and believes that it will entirely banish embryotomy or foetal murder. The Cæsarean operation, followed or not by amputation of the uterus and ovaries, will become more and more rare; indications will be found only in the happily not very numerous cases of uterine and other tumors filling the pelvic cavity—although experience has shown symphysiotomy to be adapted to certain cases of this kind. In subjects of contracted pelves, the Cæsarean section ought only to be recognized in cases of absolute necessity. It is not so easy to decide in a given case between symphysiotomy and the induction of premature labor with the application of forceps; it will at least prevent the induction of labor too prematurely. It will also render unnecessary all forcible applications of the forceps, with their coincident evil effects upon the mother and child.

It exercises a beneficial effect in nearly all cases of pelvic contraction, such as those simply small or flattened, those contracted by rickets—without contraction at the pelvic entrance—and pelves contracted at the outlet, the latter gaining more from symphysiotomy than when the entrance is affected. In a symmetrical pelvis, and especially those obliquely oval with synostosis of one sacro-iliac symphysis, symphysiotomy loses one-half or all of its advantages, but the author remarks that in a case of this kind he has successfully performed ischio-pubiotomy, an operation devised by Faraboeuf, —London *Lancet*, February 18, 1893.

JAMES E. PILCHER (U. S. Army).

## REVIEWS OF BOOKS.

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A TEXT-BOOK OF THE THEORY AND PRACTICE OF MEDICINE BY AMERICAN TEACHERS. Edited by WILLIAM PEPPER, M.D., LL.D., etc. In two volumes, illustrated, royal octavo. Vol. I, 909 pages, 58 illustrations, 3 plates. Philadelphia: W. B. Saunders, 1893.

This work on the Theory and Practice of Medicine is—to quote from the announcement—“composed of a series of articles (each bearing the author's name) upon each disease, or set of diseases, by various authorities, selected with care from the faculties of the various medical schools of the country, with a view to obtain the very best and latest opinions and treatment of specialists in each department of medicine; and will, therefore, thoroughly represent the subjects as taught in American colleges.” In support of this statement it will only be necessary to say that the men thus associated are Welch, Delafield, Janeway, Osler, and others of equal eminence, and that the editor himself is the author of a number of the most valuable articles in the series.

To attempt to review at length all of the articles which appear in this volume is needless, but several of them, somewhat in the line of innovations in a text-book devoted to general medicine, merit special attention.

The first of these is the opening article on Hygiene, by J. S. Billings, a subject much neglected by students and by practitioners, but one which is becoming more and more to be recognized as essential for the scientific prevention and treatment of disease. Dr. Billings discusses at length such topics as disinfection, isolation, habitations, water supply, sewage disposal, house sewerage, ventilation and sanitary jurisprudence, and, as the writer has had at his dis-

posal unusual facilities, quite out of the reach of the average physician, his views are of more than ordinary value.

A large part of this first volume is devoted to the various forms of fevers, including the exanthemata and some of the infectious diseases. The various articles are clearly and concisely written, and are made of special value by the exhibition of temperature charts wherever needed; and also by a careful description of bacteria and other micro-organisms when their relation to a given disease is definitely known. The articles on typhoid, typhus and cerebro-spinal fevers and influenza, by William Pepper; on the exanthemata, especially scarlatina and measles, by James T. Whittaker, and on syphilis, diphtheria, yellow fever and cholera, by W. Gilman Thompson, deserve special commendation. Besides these more usual diseases, the rarer ones of dengue, relapsing fever, actinomycosis, anthrax, hydrophobia and many others are not forgotten.

Horatio C. Wood and William Osler have contributed the various articles that go to make up the latter half of the volume, which is devoted to nervous affections. The general symptomatology of diseases of the nervous system is given at some length, and in the succeeding articles functional and organic diseases of the brain and of the spinal cord are described in full detail.

The long chapter on insanity, by the first of the above mentioned authors, is another innovation in such a text-book, and is worthy of more than a mere mention. A thorough explanation of the various factors involved in the diagnosis of insanity (such as delusions, systematized delusions, hallucinations, morbid desires, etc.) serves as an introduction to the subject. The author, like Krafft-Ebing, of Vienna, regards "many of the so-called insanities as mere symptom-groups arbitrarily separated;" and the systems of classification, adopted by these two noted alienists, are very similar and very simple, a fact for which all students should be thankful, for it does much to dispel the clouds of uncertainty which nomenclature-mad writers have drawn about the subject.



The pathology, so far as is known, in each condition is presented to the reader—as it is indeed throughout the book—but no attempt is made to show that all conditions can be explained by the findings in a stained section. The author says: “I believe the changes are physical, but I believe it is not within human power to recognize their nature. The microscope is a coarse blundering tool, powerless to reveal the ultimate changes of nervous protoplasm run mad.”

The various types of mental diseases are clearly described, and cogent examples cited, so that taken altogether, the chapter is one of the most valuable in the volume.

The work is well written throughout. The most recent investigations, as regards causation, symptomatology, diagnosis, prognosis and treatment, are given in such a way as to be valuable to the student as a text-book, and to the practitioner as a book of reference. Immunity is discussed at length. The sections devoted to diagnosis embody the methods of special diagnosis as well, so that the use of separate books of reference on these subjects is for the most part unnecessary.

Books such as this are especially apt to impress one with a realization of the enormous advances in the medical sciences which have been made within recent years. “In the good old colony times,” and even down to the student days of living practitioner’s text-books on medicine were written, in which one man was wont to discuss in a moderate-sized volume all of the subjects of medicine, including under that heading surgery, diseases of the eye, the ear, the skin, etc. This old order of things gradually disappeared, and then came the era of separate volumes devoted to each of these subjects. Of late years even this has proved to be too wide a field for writers to cover well; and now individual diseases, and even variations of a given disease, have been made the subject for elaborate monographs or treatises.

In medicine and surgery, which seem to require a consideration of the entire subject in one or two volumes, the co-operative system,



which has accomplished so much in more material ways, has been employed, and men who have attained eminence in special fields, unite in writing a book which, when complete, embodies the most advanced ideas of the best practitioners of the day.

The American systems of obstetrics, of gynæcology and of surgery, which are already well known and widely used among the profession, are good examples of this type of work, and this latest bidder for popular favor is sure soon to take its place by their side.

H. P. DE FOREST.

NUEVA CONCEPTA DE LA HISTOLOGIA DE LOS CENTROS NERVOSOS.

Por el DR. D. SANTIAGO RAMON Y CAJAL. Conferencias pronunciados en la Academia y Laboratorio de Ciencias Medicas de Cataluna. March 14, 18, 19, 1892, Barcelona, 1893. ("New conception of the histology of the nervous centres.")

This *brochure* in Spanish, reprinted from the *Revista de Ciencias Medicas*, of Barcelona, contains in three lectures a statement of the results of the comparatively recent investigations that have, in some respects, rather revolutionized our ideas on the finer structure of the nervous centres. The author speaks with authority, since his personal labors have contributed no small part, if not, indeed, the greater part, to these results. The general conclusion of his lectures as given are of interest, as his own statements of these important contributions to our knowledge. Stated briefly they are as follows:

(1) The most general conclusion relative to the morphology of the cells of the centres is the absence of substantial continuity between the expansions of the nervous, epithelial, and neuroglia corpuscles. The nervous elements represent true cellular unities, or *neuronas*, to use Waldeyer's term.

(2) There being no substantial continuity, the currents must com-

municate from one cell to another by contiguity or contact. This contact takes place between the terminal or collateral arborizations of the cylinder axes on the one hand, and the cell bodies and protoplasmic arborizations on the other. When, as happens in some cases, these protoplasmic expansions are lacking, the cellular superficies is the only part to which the nervous arborizations are applied.

(3) The probable direction of the nervous conditions in the cells which possess both kinds of expansions is cellulipetal in the protoplasmic expansions, and cellulifugal in the cylinder axes.

(4) In the bipolar cells (acoustics, olfactory, retinal, etc.) the peripheral expansion is coarse, and should be considered as of protoplasmic significance, being destined to collect the currents (cellulipetal).

(5) The protoplasmic expansions are not mere nutritive apparatuses, as has been held by Golgi, a sort of channel for the plasma exuded from the capillaries, as they have a conductive function the same as the cylinder axes. The asserted facts invoked in favor of this theory, the grouping of the protoplasmic expansions around the vessels, and their connection with the neuralgia cells have been confined to Cajal, Lenhössek, Van Gehuchten, Kolliker, Retzius, Schaefer, etc.

(6) The extreme length of certain protoplasmic processes (pyramidal cells of brain, Purkinje cells, etc.), as also the richness of the lateral and basilar protoplasmic expansions, seem to bear a relation with the number of nervous arborizations, the currents of which they receive. The interspinous roughnesses, etc., exhibited by many protoplasmic arborizations, probably represent the places of impression or contact of the terminal nervous fibres.

These conclusions are given more in detail than as stated here, and are supported by various facts of human and comparative anatomy. They are given here in brief as an authoritative statement of the principal results of these very recent and important researches, by one of the chief of the investigators, to whose labors we owe them. For a full statement of these facts we must refer the reader

to the work itself, or the similar general statements of Lenhossek and others.

It is a noteworthy fact that Spain, a country that has for a long time been less active in scientific matters than perhaps most other European nations, has come to the fore in these discoveries by the works of the author of these lectures.

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A NEW METHOD OF DIRECT FIXATION OF THE  
FRAGMENTS IN COMPOUND AND  
UNUNITED FRACTURES.<sup>1</sup>

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THE treatment of compound and ununited fractures has always been a fruitful field of research and observation for the surgeon. Notwithstanding that this subject has been the special study of many able surgeons, it has not reached the stage of perfection its importance demands. It is true that the adoption of rigid antiseptic precautions in the treatment of compound fractures has reduced the mortality from 50 to 70 per cent. almost to *nil*, and the same has rendered operations for ununited fractures nearly devoid of danger. On the other hand, it must be admitted that the mechanical treatment of both these classes of fractures has undergone but little improvement during the last decade, which has witnessed such marvelous improvements in other departments of surgery. No systematic attempts have been made to utilize the wound in compound fractures for the purpose of securing accurate reduction and perfect retention. For many years the operative treatment of ununited fractures has undergone no material change. The principal object of this address is to make an earnest plea in favor of a more frequent recourse to direct means of fixation in the treatment of compound and ununited fractures. It appears to me that the time is at hand when a compound fracture should be treated upon the same prin-

<sup>1</sup> President's Address, delivered at the meeting of the American Surgical Association, May 30, 1893.

ciples as a wound of the soft parts, viz., to bring into apposition and hold in contact by direct temporary mechanical measures the different anatomical constituents of the wound until the process of repair is completed. As soon as this method of treatment is perfected and more generally adopted, we shall hear less frequently of the many unsatisfactory remote results of these injuries, such as delayed and non-union paralysis, impairment of general health from long confinement to bed, shortening, angular deformity, displacement by rotation, exuberant callus, and permanent injury to adjacent joints from long-continued permanent extension. In very oblique fractures, compound as well as simple, interposition of soft tissues takes place more frequently than is generally supposed, and this condition not infrequently is the sole cause of non-union. In oblique fractures of the femur it is generally conceded that continued extension and external fixation do not succeed in preventing more or less shortening and angular deformity. It is a well-known fact that long-continued extension is usually followed by temporary and often by permanent injury to the adjacent joints. Over-riding of fragments is often productive of harmful pressure upon important vessels and nerves. Displacement of fragments and imperfect immobilization are the most potent factors in the production of exuberant callus which so often impairs the functional result and so frequently causes remote painful affections. Displacement of detached fragments in comminuted compound fractures is often not recognized, and much less frequently corrected without direct intervention.

Thorough disinfection is frequently out of question without enlarging the external wound and free exposure of the seat of fracture.

Long-continued confinement in bed incident to treatment of fractures of the lower extremities is detrimental to the general health of the patient, and is often the indirect cause of many fatal intercurrent affections. These evils attending the treatment of compound fractures heretofore in vogue can be avoided in a measure by resorting to direct fixation of the fragments. Direct treatment of the fracture does not add to but diminishes the danger of traumatic infection, provided the operation is done under strict

antiseptic precautions. It not only enables the surgeon to bring the fragments into accurate apposition and secure permanent retention, but it also makes it possible for him to disinfect every part of the wound, and to arrest the hæmorrhage, important elements in the prevention of traumatic infection. Such treatment thoroughly and conscientiously carried out imparts a sense of security regarding the usual immediate and remote complications which is foreign to the ordinary routine treatment.

#### HISTORY OF DIRECT IMMOBILIZATION OF FRAGMENTS.

The same means which have been resorted to in holding the fragments together in the operative treatment of ununited fractures have been employed occasionally in immobilizing compound fractures. The objects to be obtained in both forms of fracture were the same, viz., to bring the fractured or vivified surfaces in contact and secure perfect retention during the process of repair.

*Suturing.*—Perhaps the oldest method of accomplishing direct fixation is suturing. Different kinds of metallic wire, silk, silkworm gut and absorbable sutures have been employed for this purpose. Silver wire is the material most frequently used. Before antiseptic surgery was practiced the ends of the wire were brought out of the wound with the intention of removing the suture, as soon as the object for which it was employed had been realized. Since it has been ascertained by experiments and clinical observations that small antiseptic substances can be safely left in aseptic wounds, the wire was cut short to the twist with the expectation that the suture would become encysted and remain indefinitely in the tissues without causing any disturbance. In oblique fractures with a tendency to shortening, the tension on the suture is great, and undoubtedly has often seriously impaired the nutrition of the part of the fragments included in the suture. For good reasons the bone suture has often been charged with causing necrosis. The old method of suturing fragments is very defective, as the suture was made only to include one side of the broken bone.



ciples as a wound of the soft parts, viz., to bring into apposition and hold in contact by direct temporary mechanical measures the different anatomical constituents of the wound until the process of repair is completed. As soon as this method of treatment is perfected and more generally adopted, we shall hear less frequently of the many unsatisfactory remote results of these injuries, such as delayed and non-union paralysis, impairment of general health from long confinement to bed, shortening, angular deformity, displacement by rotation, exuberant callus, and permanent injury to adjacent joints from long-continued permanent extension. In very oblique fractures, compound as well as simple, interposition of soft tissues takes place more frequently than is generally supposed, and this condition not infrequently is the sole cause of non-union. In oblique fractures of the femur it is generally conceded that continued extension and external fixation do not succeed in preventing more or less shortening and angular deformity. It is a well-known fact that long-continued extension is usually followed by temporary and often by permanent injury to the adjacent joints. Over-riding of fragments is often productive of harmful pressure upon important vessels and nerves. Displacement of fragments and imperfect immobilization are the most potent factors in the production of exuberant callus which so often impairs the functional result and so frequently causes remote painful affections. Displacement of detached fragments in comminuted compound fractures is often not recognized, and much less frequently corrected without direct intervention.

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Long-continued confinement in bed incident to treatment of fractures of the lower extremities is detrimental to the general health of the patient, and is often the indirect cause of many fatal intercurrent affections. These evils attending the treatment of compound fractures heretofore in vogue can be avoided in a measure by resorting to direct fixation of the fragments. Direct treatment of the fracture does not add to but diminishes the danger of traumatic infection, provided the operation is done under strict



antiseptic precautions. It not only enables the surgeon to bring the fragments into accurate apposition and secure permanent retention, but it also makes it possible for him to disinfect every part of the wound, and to arrest the hæmorrhage, important elements in the prevention of traumatic infection. Such treatment thoroughly and conscientiously carried out imparts a sense of security regarding the usual immediate and remote complications which is foreign to the ordinary routine treatment.

#### HISTORY OF DIRECT IMMOBILIZATION OF FRAGMENTS.

The same means which have been resorted to in holding the fragments together in the operative treatment of ununited fractures have been employed occasionally in immobilizing compound fractures. The objects to be obtained in both forms of fracture were the same, viz., to bring the fractured or vivified surfaces in contact and secure perfect retention during the process of repair.

*Suturing.*—Perhaps the oldest method of accomplishing direct fixation is suturing. Different kinds of metallic wire, silk, silkworm gut and absorbable sutures have been employed for this purpose. Silver wire is the material most frequently used. Before antiseptic surgery was practiced the ends of the wire were brought out of the wound with the intention of removing the suture, as soon as the object for which it was employed had been realized. Since it has been ascertained by experiments and clinical observations that small antiseptic substances can be safely left in aseptic wounds, the wire was cut short to the twist with the expectation that the suture would become encysted and remain indefinitely in the tissues without causing any disturbance. In oblique fractures with a tendency to shortening, the tension on the suture is great, and undoubtedly has often seriously impaired the nutrition of the part of the fragments included in the suture. For good reasons the bone suture has often been charged with causing necrosis. The old method of suturing fragments is very defective, as the suture was made only to include one side of the broken bone.

The technique of bone suture has recently been materially improved. Wille (*Eine Verbesserung der Technik der Knochen-sutur. Centralblatt f. Chirurgie*, 1892, No. 46), has recently modified the old method in so far that the wire is made to

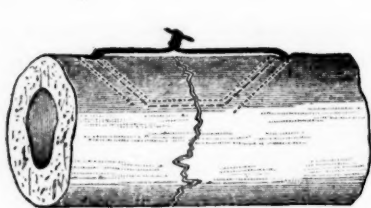


FIG. 1.—Old method of bone suture.

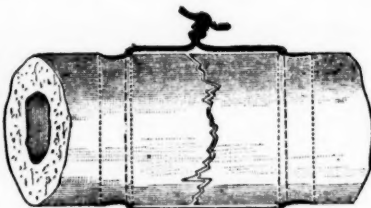


FIG. 2.—Improved bone suture. Transverse fracture, wire suture including entire thickness of both fragments.

include the entire thickness of both fragments in wiring transverse and slightly oblique fractures.

The same author has also shown that in suturing oblique fractures by this method the suture does not prevent lateral and longitudinal displacement, as can be seen from the two illustrations represented by Figs. 3 and 4.

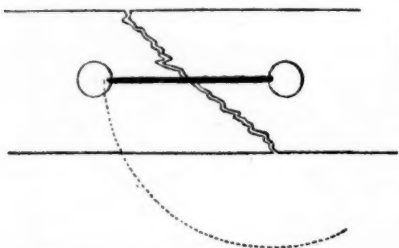


FIG. 3.—Oblique fracture sutured, showing curve in which fragment will become displaced.

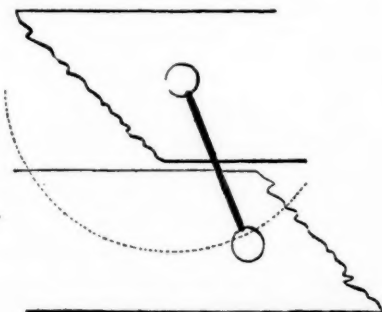


FIG. 4.—Extent of lateral and longitudinal displacement that may occur.

The further the drill openings are apart the greater will be the tendency to displacement. In very oblique fractures Wille advises to cut two grooves with a file or saw in the fragments, the direction of the groove being at a right angle to the fractured

surfaces, and the tying of the fragments firmly together with silver wire.

If the seat of fracture is sufficiently accessible so that the drill can be applied vertically to the fractured surfaces, he drills

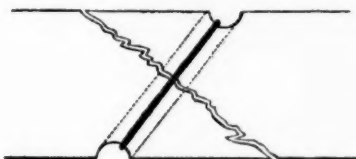


FIG. 5.—Peripheral groove for wire.



FIG. 6.—Lateral groove for wire.

through both fragments, and with a hook of his own device pulls a silver wire through the perforation, cuts the wire in the centre, and twists each half separately.

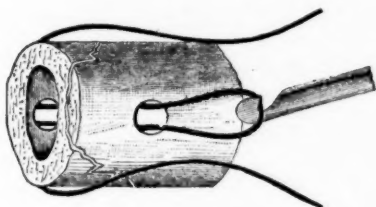


FIG. 7.—Wire drawn through the perforation.

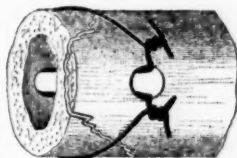


FIG. 8.—Wire cut in the centre and each half twisted separately.

It appears to me that in operating by this method it would be much better not to cut the wire, but pass both ends through the loop and twist them in the same manner as in tying the

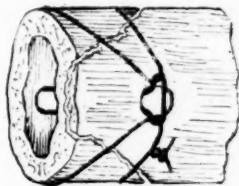


FIG. 9.—Author's modification of twisting the wire, Staffordshire knot.

Staffordshire knot. These modifications of suturing the fragments are a great improvement upon the old method, but do

not set aside all of the objections to the silver wire suture. The drilling of the fragments, the passing of the silver wire through the perforation made with the drill, the twisting of the wire, are details which often require a great deal of time and are attended by many and frequently insurmountable difficulties; at the same time the necessary degree of immobilization is not attained without exposing the bone to harmful linear compression. Chromicized catgut would be the ideal material, but it does not furnish adequate mechanical support for a sufficient length of time. Professor Park has recently resorted with success to silkworm gut as a substitute for silver wire in the direct treatment of an ununited fracture.<sup>1</sup> While such means of direct fixation may frequently answer a useful purpose in the treatment of ununited fractures, they are not applicable in maintaining retention in very

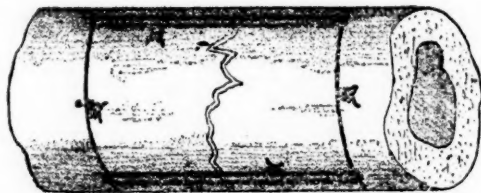


FIG. 10.—Dollinger's bone ligature as a substitute for bone suture.

oblique recent fractures, owing to the strong muscular contractions invariably present in such cases.

Dollinger<sup>2</sup> describes a new method of bone suture, or rather bone ligature, which he has made use of in two cases where perforation of the bone could not easily be carried out. In one case, pseudarthrosis of the leg, in a man forty-three years old, the tibia was sutured in the usual manner. The fibula was fractured in two places, the middle piece, about four inches in length, lying loose. The fragments could not be perforated without causing further separation of the periosteum. A ring of silver wire was placed around the lower part of the upper frag-

<sup>1</sup> American Journal of the Medical Sciences, April, 1890.

<sup>2</sup> Knochennaht ohne Durchbohrung des Knochens, Centralblatt für Chirurgie, 1893, No. 2.

ment a little above the seat of fracture, and a similar ring around the upper part of the middle fragment. A piece of wire was then placed on each side of the fragments, parallel to the long axis of the bone and within the two rings encircling the bone. The rings were then tightened up and fixed, and then the longitudinal wires were doubled over and their ends united on each side. The second fracture was dealt with in a similar manner. In eight weeks union by bony callus had taken place. In the second case the tibia was sutured in a similar manner, after a piece had been resected along with a tumor which had developed in the part. The resected ends were hard and ivory-like and could not be readily sutured in the ordinary way. While this method of suturing may guard effectively against diastasis of the fragments, it certainly could not prevent lateral displacement and shortening in oblique fractures.

*Metallic Spikes and Screws.*—Among the older methods of direct fixation of compound and ununited fractures must be mentioned the sharp metallic spikes recommended by Malgaigne. Dieffenbach transfixed the fragments with an iron nail and applied over it and including one side of the fragments a figure-of-8 suture. Langenbeck used two steel screws which were driven into the fragments, and which were then connected by an iron bar, which effected immobilization of the fragments.

*Ivory Cylinders and Clamps.*—Volkman and Heine inserted an ivory cylinder into the medullary cavity of the fragments across the line of fracture with a view of preventing lateral and longitudinal displacement. The former applied this treatment in three cases with satisfactory results. In two cases of ununited fracture of the humerus he used an ivory nail, which reached some distance into the medullary cavity of each fragment. In the third case he treated an ununited fracture of the femur in a child by inserting into the medullary canal a piece of fresh bone taken from an amputated limb. In all of these cases the foreign substance healed in and was undoubtedly eventually removed by absorption. This method of treatment has been

more fully described by Bircher,<sup>1</sup> to whom it has generally been accredited. Bircher uses a solid ivory cylinder. Its method of insertion and relative position to the fragments are shown in Fig. 11.

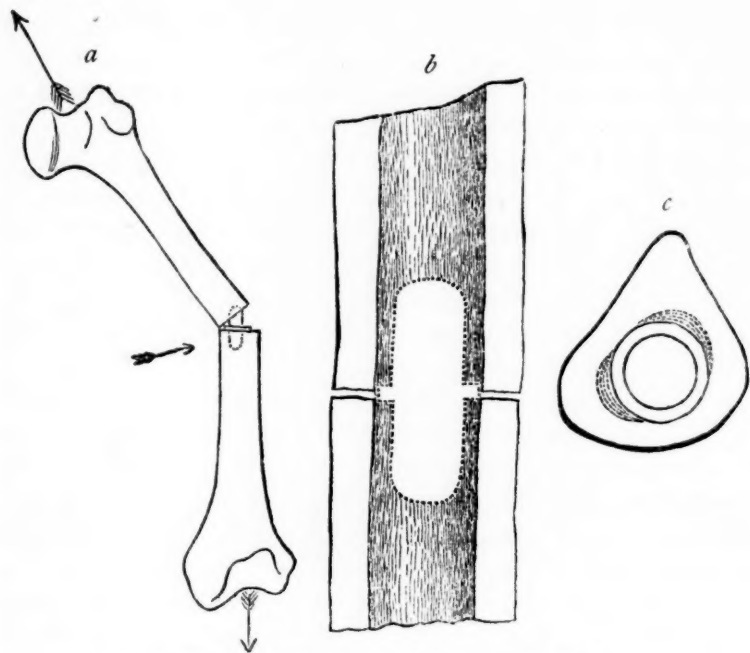


FIG. 11.—Bircher's method of retention with ivory cylinder.

- a* { Direction of pressure.  
Traction upon leg.
- b* { United fracture place.  
Longitudinal section. Natural size.
- c* { Transverse section showing ivory cylinder in the interior of the medullary canal.

To prevent slipping of the ivory cylinder upward or downward he makes a shoulder or projection at the centre on one side of the cylinder, which rests in a depression made with a chisel in one side of the medullary canal, as is shown in Fig 12, or in a bone defect at the seat of fracture, as in Fig. 13.

The ivory clamp which he uses in uniting fractures of parts

<sup>1</sup> Eine neue Methode unmittelbarer Retention bei Fracturen der Röhrenknochen. Archiv. f. klinische Chirurgie, Band XXXIV, S. 410.

of bones devoid of a medullary cavity resembles the capital letter H, one bar of which rests in the channels cut on each side in the bone, while the other bar rests on the surface of the fragments.

Bircher treated by these methods of fixation five cases, four compound fractures, and one subcutaneous fracture (femur) com-

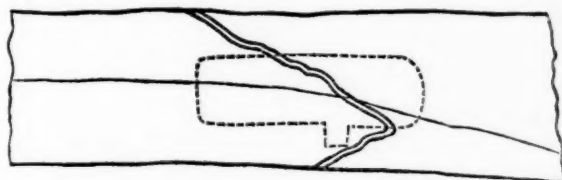


FIG. 12.—Shoulder of ivory cylinder fixed in depression of wall made with chisel.

plicated by a large hæmatoma. In all of the cases more or less suppuration followed, and the foreign body was removed as soon as firm consolidation had taken place. In every instance bony union in good position with very little shortening was secured, and the functional results were excellent. In the com-

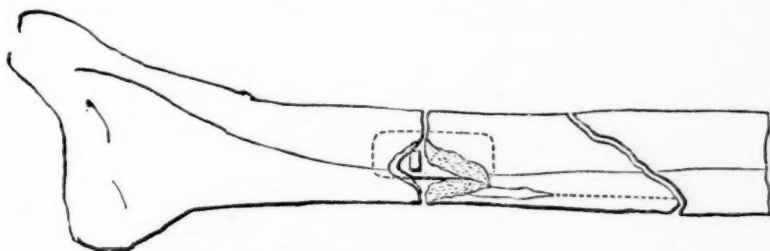


FIG. 13.—Projection of ivory cylinder resting in defect at seat of fracture.

pound fractures infection had taken place before the treatment was commenced.

Socin<sup>1</sup> has given this treatment quite an extensive trial, and is pleased with the results. He has applied it in pseudarthrosis caused by defective reposition or interposition of soft parts, and in many cases of compound fracture. He does not resort to

<sup>1</sup> Die Behandlung gewisser Knochenbrüche mittelst Einlegen von Elfenbeinstiften in die Markhöhle.—Correspondenzblatt f. Schweizerärzte, 1887, No. 12.



the operative removal of the ivory cylinder. The method has yielded such encouraging results in his hands that he intends to extend it to the treatment of subcutaneous fractures, with a strong tendency to displacement of the fragments, as in very oblique fractures of the lower third of the tibia.

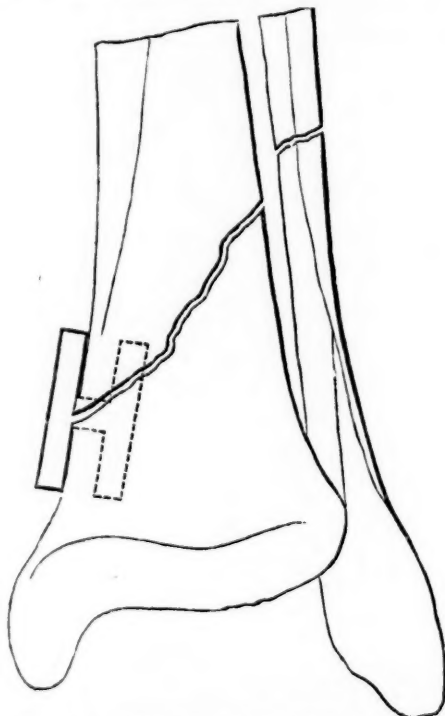


FIG. 14.—Retention of oblique fracture of lower end of tibia by ivory clamp.

#### ABSORPTION OF ASEPTIC IVORY AND BONE IN THE LIVING TISSUES.

The insertion of a solid ivory cylinder into the medullary cavity of the shaft of the long bones as a means of direct fixation is not applicable in the treatment of very oblique fractures, as immobilization and retention cannot be thus secured. Again, the introduction of such a large and solid foreign substance overtaxes the absorptive capacity of the tissues, and either removal by operative treatment becomes necessary, or spon-

taneous elimination is sure to take place sooner or later. There is a limit to the absorption of aseptic absorbable bodies. While an aseptic ivory or bone nail driven into bone for the purpose of exciting callus production, or to serve as a temporary means of fixation, will be removed by absorption in the course of time, if their immediate vicinity remains aseptic, a similar disposal of a solid ivory cylinder the size of the little finger could hardly be expected. Gluck's experiments with ivory joints have taught us an important lesson, and that is not to impose too much upon the intrinsic absorptive capacity of the tissues. Of one thing we are now certain, that the diminution in size, and the ultimate removal of such bodies are not brought about by the corroding action of pus, as has been claimed by many, but by the action of living tissues. The mechanical effect is the same whether a solid or hollow cylinder of ivory or bone is used. I would,



FIG. 15—Author's hollow perforated intra-osseous splint.

therefore, recommend as absorbable intra-osseous splints hollow, perforated cylinders of bone. The use of such cylinders does not interfere with the early formation of the intermediate callus from the medullary tissue. Instead of crushing the medullary tissue, as is done by the use of the solid cylinder, the lumen of the hollow cylinder is filled at once with this valuable bone-producing material, and the product of tissue proliferation, and the new bloodvessels later fill the perforations, and establish communication between the process of repair within and outside of the cylinder. The surface for absorption of the foreign substance is also immensely increased, and thereby the probability of its spontaneous removal greatly increased. Such cylinders should be made of the shaft of the long bones of young animals, such as chickens, turkeys, or rabbits. The medullary cavity can be increased in size by the use of a small round file, and the per-

forations made with a drill. The length of this intra-osseous splint will vary, according to the size of the bone and the obliquity of the fracture, from one to three inches. Displacement of the splint upward or downward need not be feared if additional immobilization is secured by an appropriate external support. Experimental research and clinical experience have demonstrated that pieces of aseptic ivory or bone of moderate size are removed by absorption in aseptic tissues. These substances, must, therefore, be included among the absorbable means of direct fixation of compound or ununited fractures. The encapsulation of unabsorbable material, used for the same purpose, is always an uncertain process, and it is a well-known clinical fact that even encapsulated foreign substances may give rise to disturbances at any

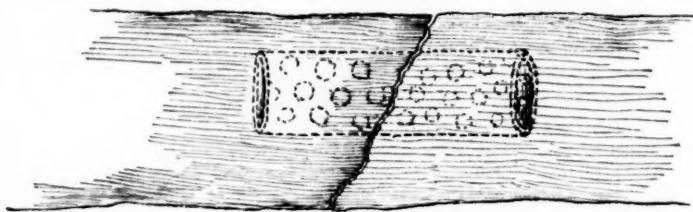


FIG. 16.—Intra-osseous splint *in situ*.

time. Trendelenburg<sup>1</sup> reports a somewhat unusual fate of an ivory nail which was used in the fixation of an ununited fracture of the lower end of the femur. The patient died two and a half years after the operation. Post-mortem examination showed that the fracture had united firmly by bony callus. The ivory nail had been driven into the bone in such a manner that it projected into the knee joint. That part of the nail in the bone remained unchanged, while the part which projected into the joint had become detached, and was found as a sequestrum in a small cyst which had formed in the capsule of the joint. The ends of this fragment were rounded off, and the surface was covered with giant cells. This observation would tend to prove that ivory may remain intact in aseptic bone tissue, while absorption

<sup>1</sup> Mittheilungen aus der chirurgischen Klinik zu Rostock, 1881.

takes place at a point where the foreign substance perforates the periosteum, that is, on the surface of the bone.

Riedinger<sup>1</sup> made experiments on animals in reference to the fate of ivory nails and fragments of bone and other material implanted into living bone. Wood, rubber, etc., produced in every instance suppuration, and was invariably eliminated. Ivory and fragments of bone, even if taken from another species of animals, produced no such result, and were gradually reduced in size, and finally disappeared. - He made the observation that the speed with which the material disappeared by absorption depended on the vascularity of the bone. In one experiment a fragment of bone which was driven into a perforation of the shaft of a long bone did not undergo absorption except that part which projected into the medullary cavity. He ascertained, also, by his experiments that ivory or bone pegs driven into the shaft of a long bone brought about elongation of the bone. Two ivory pegs inserted into the left tibia of a dog increased the length of the bone 4 mm.

Aufrecht<sup>2</sup> observed that in a case of pseudarthrosis treated by transfixion with ivory pegs, that the surface of the pegs became rougher the longer they remained in the bone. Their surface was covered with giant cells. His investigations concerning the absorption of ivory in bone led him to the following conclusions:

(1) Giant cells originate by confluence of cells as described by Ziegler.

(2) Giant cells appear in places where an obstacle is found to the transformation of fibroblasts into connective tissue, or where in the cells themselves the capacity for the formation of connective tissue is reduced.

(3) The giant cell can bring about resorption of bone, probably in so far as on its existence depends the accumulation of carbonic acid.

<sup>1</sup> Ueber Pseudarthrosen am Vorderarm mit Bemerkungen über das Schicksal implantirter Elfenbein und Knochenstifte. *Archiv für klinische Chirurgie*. Bd. 26, S. 985.

<sup>2</sup> Ueber Riesenzellen in Elfenbeinstiften, welche zur Heilung einer Pseudarthrose eingekeilt waren. *Centralblatt f. die Med. Wissenschaft*, 1877.

(4) The club-shaped closed ends of new bloodvessels can be easily mistaken for giant cells when the places of their connections with vessels are obscured by the tissues.

These experiments and observations prove that bone or ivory used in the direct fixation of a fracture can be safely left in the tissues with the expectation that the material will become encysted and remain harmless, and that in the course of time it will be removed by absorption. They also teach that these substances are more rapidly removed by absorption when inserted into the medullary cavity, or when placed around instead of into the bone. My own experience has satisfied me that bone is absorbed more readily and in a shorter time than ivory, and on this account I prefer it to the latter material in the direct treatment of fractures. I am convinced that a hollow cylinder of bone inserted into the medullary cavity of a bone is removed completely by absorption in a comparatively short time. The same fate awaits a thin ring of bone embracing and holding in mutual uninterrupted contact two or more fragments in the treatment of compound and ununited fractures by direct fixation.

#### RETENTION OF COMPOUND AND UNUNITED FRACTURES BY DIRECT FIXATION WITH BONE FERRULE.

The most efficient way to prevent lateral and longitudinal displacement in oblique fractures of the shaft of the long bones is to bring the fractured surfaces in accurate contact, and hold them in this position by an efficient absorbable circular support. The use of silver wire and other unabsorbable suture material for this purpose is objectionable, because the linear pressure caused by the support must affect in a detrimental manner the fragments, and the circular splint, even if it becomes encysted, remains as a foreign substance liable at any time to become a source of disturbance. Catgut and other absorbable ligatures are not sufficiently durable to hold the parts in contact for a sufficient length of time. It has occurred to me that such fractures could be retained almost to perfection after

reduction by engaging the ends of the fragments in a ferrule, or ring of bone or ivory. The rough, and often denticulated, fractured surfaces, held in contact by the circular splint, will bring about interlocking of the fragments, the best safeguard against undue shortening. If the fractured surfaces are smooth, and interlocking of the fragments cannot be thus secured, shortening and lateral displacement are effectually prevented by the ring, the broken ends grasped by the ring acting like two inclined planes gliding in opposite directions, which will permit sliding of one fragment over the other only till each fragment impinges firmly against the respective side of the ring, after which further over-riding is a mechanical impossibility. Angular deformity and rotation can be readily prevented by an appropriate external support. The application of such a ferrule requires less time, is attended by less disturbance of the soft parts, and is a much easier procedure than suturing of the bone.

The results which have attended this treatment in my hands so far have been exceedingly satisfactory, and have induced me to present them on this occasion with the hope of becoming the subject of a thorough discussion on the advisability and technique of direct fixation of compound and ununited fractures.

*Preparation of Bone Ferrules.*—The ferrules are made of different sizes from fresh bone obtained from the slaughter-house or butcher-shop. For the humerus and femur of the adult the femur of an ox should be selected; for children, the same bone of a smaller animal will answer the purpose. For the tibia the corresponding bone of the animal is chosen. With a sharp saw the shaft of the bone is cut transversely, the length of the sections corresponding with the desired width of the ferrule, which will vary from a quarter of an inch to an inch. With a round file the medullary canal is enlarged until the thickness of the bone does not exceed one-sixth of an inch; in some instances a much thinner ring will furnish the necessary lateral support. If the ferrule is longer than an inch it should be perforated at a number of points in order to furnish so many avenues through which the products of tissue proliferation and the new blood-vessels can reach the tissues outside of the ferrule, and *vice versa*,



and also with the intention of facilitating the absorption of bone after the fracture has become consolidated. Ferrules made of the tibia should retain the shape of the bone in order to adapt their lumen to the treatment of fractures of the tibia. Sterilization is effected by boiling for an hour or more, after which the rings are kept immersed in sublimate alcohol, 1:1000, ready for use.



FIG. 17.—Circular bone ferrule for humerus or femur made of an ox femur.



FIG. 18.—triangular bone ferrule for tibia made of ox tibia.

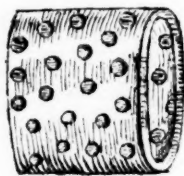


FIG. 19.—Wide perforated bone ferrule.

Future experience may show that partial decalcification of the bone ferrule is an advantage. Should further clinical experience show that the bone is not sufficiently absorbable, such ferrules could be made of chromicized catgut.

*Application of Bone Ferrule.*—In the treatment of compound fractures the observance of the strictest antiseptic precautions, and in the operative treatment of ununited fractures by this method, rigid aseptic measures must precede and accompany the direct treatment of the fracture. The seat of fracture must be exposed in such a way that both fragments are readily accessible. The ferrule must be large enough so that it can be slipped over the fragments without danger of breaking it. In the majority of cases the use of an anæsthetic is indispensable for the purpose of securing complete muscular relaxation and the necessary immobility of the limb not only until reduction is effected and the ferrule is in place, but until the whole dressing is applied and complete immobility at the seat of fracture has been assured. After the seat of fracture has been freely exposed, the most accessible fragment is isolated from the surrounding



tissues with as little disturbance of the periosteum as possible, when the ferrule is slipped over the fragment and is pushed away from the line of fracture far enough to clear the other fragment. After reduction has been accomplished, the second fragment is engaged in the ring, which is then pushed back sufficiently far to grasp both fragments securely.



FIG. 20.—Oblique fracture of femur united by bone ferrule.

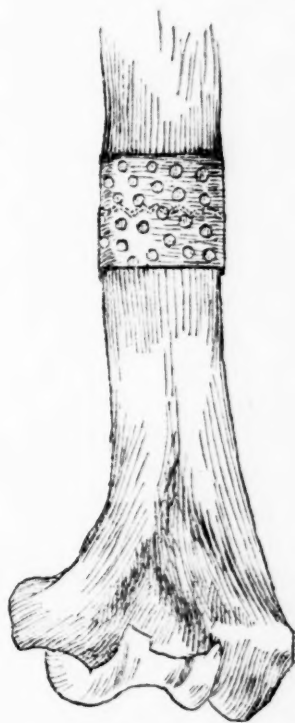


FIG 21.—Transverse fracture of humerus immobilized by a wide perforated bone ferrule.

A reliable assistant should hold the limb in proper position, as bending at the seat of fracture might break the ring. Hæmor-

rhage is to be carefully arrested, and if the wound is aseptic the different tissues are separately united by buried sutures. In case of infected fractures, and in fractures accompanied by troublesome oozing, free drainage must be established. Bending at the seat of fracture is prevented and absolute immobilization secured by a circular plaster-of-Paris splint, which can be fenestrated at a point opposite to the wound, if the wound has been drained. Harmful pressure is avoided by interposing between the surface of the limb and splint a layer of antiseptic hygroscopic cotton at least an inch in thickness, and localized decubitus is prevented by protecting all bony subcutaneous prominences with special care.

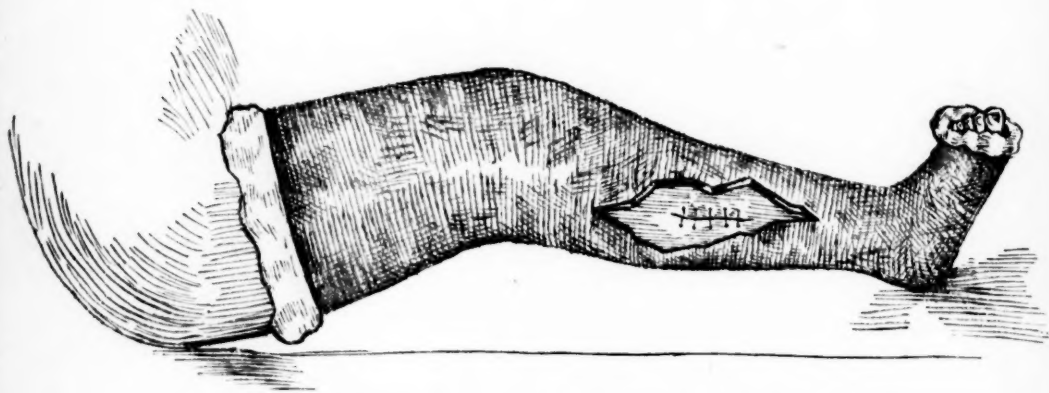


FIG. 22.—Compound oblique fracture of tibia treated by direct fixation of fragments and application of fenestrated plaster-of-Paris splint.

With a view of securing perfect immobility of the fragments as early as possible, small splints of wood or metal are incorporated in the plaster-of-Paris dressing in such a way as to form an unyielding bridge across the line of fracture, an important matter during the time required for the setting of the plaster. The limb, especially if it is the lower extremity, should be kept suspended in an elevated position for a number of days in order to prevent, as far as possible, the occurrence of œdema at and below the seat of fracture. If the wound has not been drained, and no indications for a change of dressing present themselves,

the first dressing should not be disturbed until union between the fragments is sufficiently firm to prevent displacement during the second dressing. In wounds that require drainage the dressing is changed after two to five days without interrupting the fixation splint. Should suppuration set in, the bone ferrule should not be removed until direct fixation has become unnecessary, when the sinus is enlarged, the ring cut on one side with bone forceps, and fractured on the opposite side by bending, when each half can be extracted separately. Loose fragments of bone are removed at the same time.

*Clinical Experience.*—During the short time I have had an opportunity to make use of this method of direct fixation of fractures, I have given it a trial in three cases, two ununited fractures and one compound fracture. These cases I will briefly report:

CASE I—*Ununited Fracture of Femur; Direct Fixation of Fragments; Union with Fragments in Good Position.*—A Bohemian laborer, thirty-seven years of age, in apparently good health, nineteen months ago attempted to mount a railroad engine, fell and broke the left femur at the junction of the lower with the middle third. Extension was applied the next day and was continued for a number of weeks, and when it was removed it was ascertained that the fracture had failed to unite. He was admitted into the Presbyterian Hospital April 7, 1893. Examination revealed great over-riding of the fragments; the upper end of the lower fragment could be felt as a marked prominence over the outer and posterior aspect of the thigh, while the upper fragment was on the inner side and was directed toward the popliteal space. Measurement showed nearly three inches of shortening. No provisional callus could be felt. Motion at the seat of fracture quite free. Patient was unable to walk without the aid of crutches. Operation in the clinic of Rush Medical College, April 13. The limb was constricted near the base of the thigh, and the seat of fracture exposed by a long incision through the intermuscular septum between the flexor and extensor muscles on the outer side of the thigh. A spur of new bone was found projecting at a right angle from the outer side of the upper fragment at a point corresponding with the upper end of the lower fragment. The apex of

this triangular mass of bone was connected with the lower fragment by a strong band of connective tissue. This prominence was removed with the chisel, and the lower fragment isolated from the surrounding mass of connective tissue. The fracture was originally a very oblique one, but the sharp point of each fragment had become rounded off and was covered by cicatricial tissue without a trace of callus formation. The isolation of the upper fragment proved a tedious and difficult part of the operation. No amount of extension succeeded in materially diminishing the over-riding. The fragments were vivified with a chisel in an oblique direction, but before the surfaces could be brought in contact each fragment was shortened in order to do away with the over-riding, and to enable me to resort to direct fixation with a bone ferrule. The first two rings were too small and were broken in the attempt to engage both fragments. The third ring was large enough, but was cracked on one side when by the weight of the limb a slight bend was produced at the seat of fracture. It retained its place and was strengthened by tying around it a very strong chromicized catgut ligature. The wound was united throughout by buried and superficial sutures, and the limb immobilized in a circular plaster-of-Paris splint. On the second day the temperature reached nearly 100° F., consequently the dressing was removed through a fenestrum cut in the splint, and one of the superficial sutures was removed. About an ounce of bloody serum escaped. At this point a slight suppuration followed, and the wound was drained down to the seat of fracture, and was washed out daily with peroxide of hydrogen and a weak solution of corrosive sublimate. The temperature soon fell to normal, and at the present time, five weeks after the operation, suppuration has nearly ceased, the entire wound has healed with the exception of a small fistulous tract which leads down to the bone ring. A very large callus has formed, fragments are in good position, and the shortening does not exceed two inches. The bone ring was removed in the manner described, as the union was firm enough to hold the fragments in place. The same plaster-of-Paris dressing will remain until consolidation is sufficiently firm to dispense with an external support. Owing to the existence of suppuration the bone ferrule had not undergone any appreciable changes.

CASE II—*Ununited Fracture of Humerus Resulting from Extensive Loss of Bone; Paralysis of Musculo-spiral Nerve; Direct Fixation of Fragments by Artificial Impaction and Bone Ferrule, Aided by Catgut Sutures; Secondary Nerve Suture.*—This patient was a

single lady, twenty-four years old, an American by birth, and school teacher by profession. Family history good and general health fair. Three years ago she suffered from an attack of acute suppurative osteomyelitis of the lower part of the left humerus. An abscess formed at the lower part and outer aspect of the arm, which was incised two weeks after the beginning of the first symptoms. She made a good recovery, and the abscess healed promptly with the exception of a fistulous opening which led down to the bone. At the



FIG. 23.—Ununited fracture of lower end of humerus treated by splitting upper fragment and impacting fragment corresponding with shaft of bone into the lower; immobilization by bone ferrule, two catgut sutures and plaster-of-Paris splint.

expiration of a year an operation was performed for this condition, and as it appears a resection of the entire diameter of the humerus to the extent of at least four inches was made. Since the operation the patient has been unable to extend the hand, showing that the musculo-spiral nerve was severed during the operation. The resection wound healed quickly, but there has been no attempt at union by bony callus. The patient was admitted into the Presbyterian Hospital April 1, 1893. The whole limb was atrophied. Arm very much shortened. Resected ends separated about three inches and connected by a band of cicatricial tissue. Paralysis of musculo-spiral

nerve complete. The proximal bulbous end of the nerve could be readily located in the scar, and was exceedingly painful on pressure. The operation was performed in the clinic of the Rush Medical College, April 6, 1893.

Esmarch's constriction of the limb. Line of incision through the old scar. Both ends of the musculo-spiral nerve were found and isolated. Both fragments conical. The scar tissue interposed between them was excised. The lower fragment very short; the base of the bone expanding into the condyles. The atrophy of this fragment was extreme; the bone could be cut readily with the knife. Upper fragment firmer. I found it impossible to overlap and unite by fixation the fragments in the usual manner, as I was satisfied that bony union could not be secured in this manner, and the shortening of the arm would have reached such an extent that even if bony consolidation could have been effected the arm would have been useless. I determined to pursue a somewhat novel course in securing apposition of extensive bone surfaces without further loss of bone. I made a perforation in the centre of the apex of the lower fragment, and split the upper fragment into two equal halves, and impacted the fragment corresponding with the shaft of the bone into the opening made in the lower fragment, and used the partially detached fragment as a bridge which overlapped the lower fragment to the extent of the impaction.

All the surfaces which it was intended to bring into contact were freely vivified, but no bone tissue was sacrificed. From the perforation in the lower fragment liquid fat escaped, which proved to what extent atrophy had advanced. Before the impaction was made a bone ferrule, with a number of perforations, was slipped over the upper fragment, and after impaction it was pushed downward far enough to grasp all of the three fragments. For the purpose of maintaining the impaction the upper and lower fragments were anchored to the bone ring by heavy chromicized catgut sutures. The nerve ends were resected and united by direct and paraneural sutures of catgut. The external incision had to be sutured transversely, owing to the increased shortening of the arm. No drainage. The arm and forearm were supported by a posterior angular felt splint, over which was applied a plaster-of-Paris dressing, which included also the shoulder.

The first dressing was not removed until the end of the third week, when the wound was found united throughout by primary intention. Later, a small fistulous opening formed in the centre of



the scar. At the end of seven weeks the bone ferrule was removed. It had become greatly diminished in size by absorption, which was especially well marked on the inner side of the ring. A large mass of callus was found firmly uniting the three fragments.

CASE III—*Compound Comminuted Fracture of Leg; Fixation of Tibia with Bone Ferrule; Fenestrated Plaster-of-Paris Splint; Suppuration; Efforts at Repair.*—Italian boy, twelve years of age, sustained a compound fracture of the left leg by falling from a gravel train. The bystanders asserted that a car wheel passed over the leg. The physician who was called to attend him applied a temporary dressing. He was admitted into St. Joseph's Hospital April 28, 1893, two days after the accident. A lacerated wound, three inches in length, was found over the inner and anterior aspect of the leg at the junction of the middle with the lower third. On the fibular side the skin was contused and detached from the tissues underneath over an area as large as the palm of the hand, with a torn wound in the centre. The tibia was comminuted; two large fragments completely detached were removed, as the wound was infected. Chloroform was administered, and the opening was enlarged and the wound thoroughly disinfected. The fragments overlapped each other, the upper being directed forward and the lower backward. The fibula was fractured a little higher up. On making extension the fracture could be reduced perfectly; but as soon as traction was suspended the displacement reappeared. Owing to the extent of the injury of the soft tissues, retention of the fracture by extension or external fixation was out of question, and I resorted to direct fixation. A bone ferrule with a  $\frac{3}{4}$ -inch lumen and  $\frac{5}{8}$  inch wide was slipped over the upper fragment, extension was made, complete reduction effected, when the bone ring was pushed downward sufficiently far to grasp both fragments firmly. It held the fragments in perfect apposition without extension. The wounds were packed with iodoform gauze, and after applying the external dressing the limb was immobilized in a fenestrated plaster-of-Paris splint which extended from the toes to the middle of the thigh. For about a week suppuration was quite profuse, and the temperature ranged from  $99^{\circ}$  to  $103^{\circ}$  F. During this time the wounds were irrigated twice a day with a saturated solution of acetate of aluminum, and hot compresses wrung out of the same solution were applied. The contused undermined skin sloughed, leaving a large granulating wound on the fibular side. At the end of the first week the temperature became normal and suppuration



diminished. During this time I could satisfy myself that the ring held the fragments in perfect apposition by direct inspection and touch through the wound. The fragments became covered with granulation, and at the end of four weeks union was sufficiently firm to warrant the removal of the ring. The same fixation splint was allowed to remain until the completion of the bony consolidation.

#### REMARKS.

In all of these cases the bone ferrule served an admirable purpose in maintaining complete retention of the fracture during the time required in the formation of a union sufficiently firm to render direct fixation superfluous. In the two cases in which suppuration set in soon after the treatment was initiated, the bone ferrule did not undergo any appreciable changes, while in Case 2, in which suppuration did not occur until the end of four weeks, and then only over a small space in the centre of the thin scar, a considerable portion of the ring had disappeared by absorption, and I have no doubt if it had been allowed to remain it would have been disposed of in this way. The most important requirement in carrying out this treatment successfully is to assist direct fixation in securing retention of the fracture by an immovable external circular splint of plaster-of-Paris, which should immobilize the limb uninterruptedly from the time the bone ferrule is applied until the process of repair is completed. Access to the seat of fracture should be secured through a fenestrum. It is better to use the ring a little too large than too small, as in the former case loose spaces can be packed with chips of decalcified bone, while in the latter there is great danger of breaking the ring during the application of the plaster-of-Paris splint.

#### EXPERIMENTAL INVESTIGATIONS.

Before the bone ferrule was used in the direct fixation of the fractures in the cases reported in this paper, I tested the feasibility, safety and utility of this treatment on the lower animals. Two dogs were selected for this purpose. The first experiment was made on a large black dog. The

right leg was shaved and disinfected. An incision was made down upon the femur at its middle through the intermuscular septum on the outer side of the bone. The bone was divided transversely with a chisel. A round bone ferrule about three-fourths of an inch wide and with a lumen a little larger than the shaft of the bone was applied in such a manner that it grasped both fragments equally. The wound was closed throughout by buried and superficial sutures, and sealed with an iodoform collodion dressing. The entire limb was encased in a plaster-of-Paris splint. Wire gauze was applied over the splint. The animal did not seem to suffer much from the injury; commenced to eat and walk the second day after the operation. In three weeks the splint was so much injured by the animal that it was removed. Wound healed throughout. Limb in good position, very little if any mobility at the seat of fracture. The place of fracture could be felt as a firm spindle-shaped swelling. The dog commenced to use the leg, and about a week later it would have been difficult to tell from his walking and running that the thigh had been fractured. As nothing has been seen or heard of the bone ring so far, it is safe to assume that it has become absorbed.

The second experiment was made on a much smaller dog. Through the same incision the radius and ulna were divided obliquely with a chisel, the fracture of the radius being near the elbow joint, that of the ulna about an inch lower down. The fracture of the ulna was treated by direct fixation in the same manner as in the preceding experiment, only that the ring was much narrower. The limb was immobilized in the same manner. At the end of a week it was ascertained that the wound was suppurating, and the sutures were removed. Two weeks later the splint was removed. Some motion at the seat of fracture. An abundant provisional callus rendered the further use of a splint unnecessary. During the fourth week the dog ran away, and has not been heard from since. I have no doubt that both fractures united in a satisfactory manner, but the bone ring will be eliminated sooner or later.

## CONCLUSIONS.

I trust I have said enough on the importance of direct fixation in the treatment of compound and ununited fractures to induce others to give the new treatment which I have outlined a trial. Finally, I beg leave to submit for your further consideration and discussion the following conclusions:

1. Direct fixation of the fragments is indicated in all compound fractures in which perfect retention cannot be secured by simpler measures, and in the treatment of ununited fractures requiring operative interference.

2. This method is also justifiable in the treatment of certain forms of subcutaneous fractures, in which reduction and retention cannot be accomplished without it.

3. Free exposure of the fragments in compound fractures secures the most favorable condition for thorough disinfection.

4. Perfect reduction and direct fixation of the fragments are the most reliable prophylactic measures against delayed non-union and deformity.

5. A compound fracture should be regarded in the same light as an injury of the soft tissues, and should be treated upon the same principles, viz., accurate coaptation of the different anatomical structures, and perfect retention by direct means of fixation, aided by an efficient external support.

6. Bone suture, metallic, bone and ivory nails do not furnish the necessary degree of support and immobilization in the direct treatment of fractures characterized by a strong tendency to displacement.

7. The solid intra-osseous splint of ivory or bone as advised by Heine, Langenbeck and Bircher is objectionable, because it interferes with the ideal production of the intermediate callus and its spontaneous removal, is beyond the absorptive capacity of the tissues.

8. The hollow, perforated ivory or bone cylinder, devised by the author, answers the same mechanical purpose without the objections which have been charged against the solid cylinder.

9. The safest and most efficient means of direct fixation of

oblique fractures is by a bone ferrule, which must be applied in such a manner that it surrounds both fragments.

10. Such a circular absorbable direct splint prevents to perfection lateral and longitudinal displacement.

11. Rotation of the limb below and angularity at the seat of fracture must be prevented by a carefully applied circular plaster-of-Paris splint.

12. For fractures not requiring drainage the entire wound should be closed by buried and superficial sutures, as the bone ferrule is removed by absorption.

13. In suppurating wounds the bone ferrule should not be removed until direct fixation has become superfluous by the formation of a sufficiently firm union between the fragments.

14. The external splint should be applied in such a manner that it does not require a change throughout the entire treatment, permitting at the same time access to the wound, should this become necessary.

15. Direct fixation of a fracture combined with perfect immobilization brings the different anatomical structures of the broken bone permanently into their former normal relations, preparing the way for the early initiation and speedy consummation of an ideal process of repair and the realization of a perfect functional result.

16. Should future experience demonstrate that bone is not sufficiently absorbable, the same kind of ferrules can be made of partially decalcified bone or chromicized catgut.

## THE PRESENT POSITION OF THE SURGERY OF THE HYPERTROPHIED PROSTATE.<sup>1</sup>

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THE chief interest attaching to the surgery of the prostate gland is in relation to the treatment of obstructive hypertrophy and the associated vesical conditions. Although not exactly in conformity with the title of the subject originally assigned to me by your committee, I have ventured in this paper to make no allusion to other forms of prostatic disease, but have confined myself almost entirely to a statement of the present position of those surgical problems connected with the hypertrophied prostate which are of the most practical importance.

The admirable papers in which Harrison,<sup>2</sup> McGill,<sup>3</sup> Belfield<sup>4</sup> and Moullin<sup>5</sup> have so recently and so thoroughly reviewed this subject, and the history and statistics of the various operative measures which have been employed are familiar to all of you, and are so comprehensive that I must fully acknowledge my indebtedness to them for the basis of this address.<sup>6</sup>

The main points in reference to enlargement of the prostate may be classified as follows:

1. The nature and chief varieties of the prostatic enlarge-

<sup>1</sup> Read at the meeting of the American Surgical Association, Buffalo, 1893.

<sup>2</sup> Lettsomian Lectures, 1888.

<sup>3</sup> The British Medical Journal, 1889.

<sup>4</sup> The American Journal of the Medical Sciences, 1890.

<sup>5</sup> Harveian Lectures, 1892.

<sup>6</sup> Further acknowledgment should be made to the papers of Watson (*ANNALS OF SURGERY*, January, 1889), Gouley (*Transactions of the Am. Surgical Ass.*, 1885), Keyes (*New York Med. Record*, October, 1891), Wishard (*Journ. of Cut. and Gen. Urin. Dis.*, March, 1892), Guterbock (*Berl. Sammlung klin. Vortrage*, Heft 4, 1888) and Guyon (*Annales des Mal. des Org. Gen. Urin.*).

ment and their relation to the vesical changes found associated with them.

2. The symptoms in relation to diagnosis and prognosis: (a) subjective; (b) objective.

3. The indications for (a) non-interference; (b) medical treatment; (c) palliative treatment; (d) operative treatment.

4. The choice of operation.

1. *As to the nature of the enlargement*, the views which require mention are as follows: (a) *The hypertrophy of the prostate is a part of a general condition peculiar to advancing years, characterized by widespread, degenerative changes, and by the over-production of fibrous tissue; in other words, a disseminated arterial sclerosis or general atheroma, not limited to the vessels of the genito-urinary system, but when occurring in them, producing both the prostatic hypertrophy and the rigid or feeble bladder, with their resulting symptoms.*—Guyon.

In support of this view it is said that general atheroma and hypertrophy of the prostate occur at the same period of life, and are commonly found in the same individual.

It would not be difficult, however, to establish a similar claim for the relation to atheroma of other diseases which appear by preference after middle age. I have no doubt, for example, that if carcinoma were investigated with reference to its association with arcus senilis, or with pipe-stem radials, there would be found a considerable proportion of cases in which the conditions co-existed, but no one would think of basing thereon a theory of causation.

If the prostatic disease were atrophic there would be more *a priori* probability of the truth of this view, but that the defective blood supply invariably associated with arterial sclerosis should cause the extensive overgrowth found in the common variety of prostatic hypertrophy is contrary to pathological law. Moreover, while the large majority of prostatics, *as they present themselves to the surgeon*, are men of advanced years, recent investigation shows conclusively that the original changes in the gland occur in many instances in early middle life and long before the appearance of extensive arterial disease. If we accept the asser-



tions of Griffiths,<sup>1</sup> coincided in by Moullin,<sup>2</sup> that the original growth is glandular, and of the nature of a tubular adenoma, and that the fibroid changes which unquestionably occur are secondary degenerations in this glandular overgrowth, we have another argument against the theory of Guyon, Launois and the French school. Connective tissue proliferation may be associated with general atheromatous disease, but glandular hypertrophy must be of extreme rarity.

The not inconsiderable number of cases which are found during middle life and in persons without evidence of atheroma, and the fact that in persons of very advanced age the enlargement scarcely ever begins *de novo*, are additional reasons for asserting that the weight of evidence is strongly against the correctness of the above view.

(b) *The primary change takes place in the bladder itself, and the depression of the posterior wall which is said to occur as the bladder sinks into the pelvis with advancing years, precedes prostatic obstruction and is compensated for by the development of a muscular buttress between the orifices of the ureters, tending toward the obliteration of what would otherwise prove to be an inconvenient pouch.*—Harrison.

This view would oblige us to regard the prostate as primarily a urinary organ, exercising its function, in conjunction with the bladder, in the form of a hollow muscle, funnel-shaped, with the apex downward, and giving support to the contents of the bladder. Ellis<sup>3</sup> and Harrison<sup>4</sup> have proposed to call it the prostate muscle, and the former has even suggested the name *orbicularis vel sphincter urethræ* for both the prostate and the prolongation around the membranous urethra. If this theory be correct the majority of cases of hypertrophy of the prostate are compensatory in nature, and are due primarily to the changes in tonicity and in position of the bladder itself, and to the more frequent demands made upon it in adult life to retain for long times

<sup>1</sup> Journal of Anat. and Physiology, No. 23.

<sup>2</sup> Loc. supra cit.

<sup>3</sup> Royal Med. Chir. Trans., Vol. XXII.

<sup>4</sup> Lettsomian Lectures, 1888.



considerable quantities of urine. As soon as a little pouching of the trigone takes place residual urine remains, efforts at expulsion give rise to the inter-ureteral bar and later to general prostatic overgrowth.

Opposed to this are the following facts :

The prostate is neither in its primary significance nor in its essential function a portion of the urinary tract, but is a sexual organ, and has little relation normally to either the expulsion or retention of urine. This is shown conclusively by its embryology and its comparative anatomy and physiology.

While the prostatic urethra arises with the bladder from the allantois, is entirely distinct from the rest of the urinary passages, and remains so in some instances of hermaphroditism in man and invariably in the monotremata, the prostate itself originates, as regards its glandular portion, from the mucous surfaces of the uro-genital sinus, and as regards its stroma from the genital cord surrounding the Wolffian ducts, behind the allantois and quite distinct from the bladder.

The function of the gland appears to be chiefly sexual, the secretion serving to surround and protect the spermatozoa, the muscular portion to secure the discharge of this secretion into the urethra. The gland, like the testicles, remains small until puberty when, like them, it enlarges, and soon attains its full size.

Furthermore, the prostate is well developed in many animals in whom the horizontal posture precludes the idea that it is functionally merely a continuation of the circular fibres of the bladder,<sup>1</sup> and hypertrophy is even said to have been observed in dogs.<sup>2</sup> The most striking argument in this connection rests on the alleged facts, to which I shall recur later, that like other sexual organs in animals the size and the perfection of the structure of the prostate rise and fall with the breeding season; that in geldings and other castrated animals it shrinks and almost disappears until only a small inelastic fibroid mass is left, and that the same is true of eunuchs.<sup>3</sup>

<sup>1</sup> Ellis, loc. cit.

<sup>2</sup> Bland Sutton, quoted by Harrison, loc. cit.

<sup>3</sup> Griffiths, Journ. of Anat. and Phys., Vols. XXIII-XXIV.

It seems to me that, if true, this effectually disposes of any theory which makes the prostate chiefly or exclusively an accessory organ of micturition.

This latter view is also contradicted by the facts now to be presented in relation to another explanation of prostatic overgrowth.

*(c) The growth, or growths, which make up the enlargement in prostatic hypertrophy, are analogous to those fibro-miomata so frequently found in the uterus.*

This, if true, could scarcely be said to be a full explanation of their occurrence, but by allying them to a well-known group of tumors would certainly bring us a step nearer to their comprehension.

The arguments in favor of this view are as follows: (Thompson) The prostatic vesicle is the analogue of the sinus genitales in the female—the uterine and vaginal cavities; the structure of the prostate and of the uterus is strikingly similar, and would be almost identical if the tubular glands found in the inner walls of the uterus were prolonged into its substance; the histology of the growths themselves is equally similar, differing chiefly in the predominance of the glandular element in the prostatic tumors; the varieties of the growths, from small encapsulated tumors, easily shelled out, or polypoid growths intimately connected with the uterus or prostate up to the enormous growths which far exceed the original bulk of the organ itself, are identical; or there may be in either case a general hypertrophic enlargement affecting the whole organ; lastly, these disturbances occur at about the same time in the sexual life of the two sexes, that is, during the latter half of the reproductive period. This ends sooner in the female than in the male, and accordingly we find the growths appearing in the former at a somewhat earlier age.

The significance of this striking series of analogies long ago suggested by Velpeau and later formulated by Sir Henry Thompson, cannot be ignored, although this view is dismissed in a few words by the most recent essayist upon this subject, Moullin, with the remark that there is no real homology between the uterine and prostatic tumors. He advances practically nothing in

support of this statement, with which I cannot agree. On the contrary, after reviewing the above evidence, I believe we are warranted in provisionally accepting this theory and rejecting that which makes prostatic overgrowth a symptom of general athetoma, and that which regards it as a compensatory hypertrophy secondary to the habit of partial retention and to changes in the bladder walls.

The importance of the conclusion lies in its effect upon the prognosis and treatment.

If the condition is merely a part of a general or constitutional state, or if it is secondary to changes in the vesical walls themselves, it is obvious that comparatively little is to be expected from treatment, operative or otherwise. If, on the other hand, it is a local condition, dependent on causes at present unknown, but which may be said to be inherent in the structure or in the functional condition of the gland itself, and if the changes in the bladder walls and the accumulation of residual urine are the result of the precedent prostatic disease, treatment of the latter, if early and judicious, offers much more prospect of success.

*The changes in the bladder* are occasioned by (1) the mechanical obstructions which the enlarged prostate offers to the ready and complete evacuation of its contents; (2) by the circulatory disturbance incident to pressure on the prostatic veins into which the blood from the vesical veins passes, and (3) to septic infection.

The prostate being limited in front and below by dense fascia grows upward and backward as it hypertrophies, elongating, narrowing, and sometimes markedly deflecting the urethra, and always raising its vesical orifice to a level higher than the base of the bladder. This change of level in itself makes complete evacuation of the bladder difficult, and this vicious effect is greatly accentuated by the urethral obstruction which is more or less complete, not in proportion to the size of the enlargement, but rather in accordance with its position in regard to the urethra. As a result of these changes the bladder is not entirely emptied at each act of micturition, a certain amount of residual urine remaining behind. This may gradually increase as the obstruc-

tion becomes more marked, ultimately causing dilatation of the bladder, with atony consequent on partial degeneration of its muscular walls, or, in consequence of the more vigorous bladder contraction required to empty the bladder, the trabeculæ may become enormously hypertrophied, the inner layers forming pronounced ridges. These by their contraction exert a powerful pressure upon the vesical contents which, escaping very slowly, transmit the pressure in all directions and occasion bulgings or sacculations in such weak parts of the bladder walls as are not supported by muscular bands, or by strong investing fasciæ. This hypertrophy and sacculation is further encouraged by the vesical irritability incident to venous congestion at the neck of the bladder which, as the prostatic veins become more obstructed, keeps up a condition of passive hyperæmia and erythism more potent than residual urine alone to occasion the frequently recurring desire to urinate and the muscular spasm of the sphincter at the beginning of the act which calls for such strong and recurring efforts on the part of the detrusor muscles.

Septic infection of a healthy mucous membrane by the pyogenic microbes of acute or chronic cystitis is not possible, even though such bacteria are present in the urine; when, however, the vesical mucous membrane is congested in consequence of obstruction to venous return, and by distention of the viscus and frequently recurring contractions of the detrusor muscles, it offers but slight resistance to the microbic invasion. The pyogenic microbes are generally carried to the bladder by dirty instruments or, if these are rendered sterile, through failure to cleanse the anterior urethra before the instrument is introduced into the bladder. Often cystitis develops independently of the use of instruments, probably as a result of infection conveyed by way of the urethral mucous membrane.

The pathogenic microbes usually found are the *bacillus coli communis* and the *staphylococcus pyogenes aureus*. These cause vesical lesion either by direct action, or indirectly through their ptomaines, and acting upon the urea produce ammoniacal decomposition. The ammoniacal urine in its turn acts as a powerful irritant to the bladder walls, but is the effect, not the cause, of the cystitis.

The vesical lesions incident to septic infection, the special involvement of the areas surrounding the orifices of the urethra, the ultimate thickening and contracture in the interstitial forms of the disease, the progressive infection of the ureters and kidneys in cases complicated by partial or complete retention, have been so clearly formulated that they require but passing notice.

The most important change produced in the bladder from the standpoint of the surgeon is its loss of power to evacuate its contents even when the mechanical obstruction is relieved. This may be due to overdistention, to sacculation, or more commonly to crippling of the detrusor muscles as a result of the chronic inflammation. According to Thompson, habitual catheterization alone, continued for two years, is sufficient permanently to destroy the power of the bladder to evacuate its contents. This loss of power is rapid in proportion to the extent of obstruction, the amount of residual urine, and the severity of the chronic cystitis.

#### SYMPTOMS OF ENLARGED PROSTATE.

*A. Subjective.*—Mechanical impediment to the rapid and free evacuation of the bladder, and the resultant effect on this viscus and ultimately on the general health occasion certain symptoms which, though not pathognomonic of prostatic hypertrophy, are sufficiently conclusive when taken in connection with the history of the case and certain physical signs elicited on direct examination. These subjective symptoms are :

1. *Undue Frequency of Urination, Particularly at Night.*—

This symptom is usually attributed to residual urine. In the early stages of the enlargement the moderate amount of residual urine, if normal in quality and if not undergoing ammoniacal fermentation in consequence of intercurrent cystitis, is no more irritating to the bladder, and produces no more urgency and frequency of urination than do the first few ounces of urine secreted after the bladder has been emptied. If a bladder which holds ten ounces comfortably fails to evacuate the last ounce of water, the only effect of this is to reduce the comfortable capacity of the viscus to nine ounces, thus necessitating an increase in the number of urinations not sufficient to be appreciated, and not com-

mensurate with the frequency noted in many cases where the residual urine is small in quantity. That residual urine alone, without the supervention of congestion or inflammation of the vesical mucous membrane, is not sufficient to cause frequent urination is shown by the fact that a healthy man may voluntarily retain in his bladder portions of the urine at each micturition, and yet will suffer no appreciable increase in the diurnal number of micturitions. Moreover, I have seen many cases where, with a notable amount of urine present, the urinations were not unduly frequent. Finally, the fact that the desire to micturate is most distressing at night is not compatible with the theory that this symptom is directly dependent upon residual urine.

The true cause of frequent micturition is undoubtedly a congested or inflammatory condition of the neck of the bladder and the prostatic urethra. Such inflammation would be markedly aggravated by ammoniacal urine; hence, when the residual urine undergoes this change in consequence of cystitis, it becomes an important factor in the causation of frequent urination.

When, on account of increasing obstruction, the residual urine becomes sufficient in quantity nearly to fill the bladder, it will then occasion frequent urination, because the addition of a few ounces to the nearly full viscus is sufficient to produce a bladder tension which reflexly excites the detrusor muscles.

The cause of frequent urination should then be ascribed primarily to a urethro-cystitis, or to congestion, reflexly exciting the desire to urinate; later, to residual urine.

*Difficulty in Starting the Stream.*—This symptom, which is perhaps even more characteristic than frequent urination, is due not to mechanical obstruction, but to muscular spasm of the external vesical sphincter, which, excited by reflexes from the hyperæsthetic prostatic urethra and neck of the bladder, is not fully under the control of the will. A temporary reflex inhibition of the detrusor muscles may also delay the act of urination.

*Feebleness of the Stream.*—A full stream dropping almost vertically from the penis, *i.e.*, without the normal parabolic curve, is a classical symptom of enlarged prostate. The loss of the parabolic curve is sufficiently characteristic and common, and is



caused at first by mechanical obstruction, later by atony. The passage of a full stream is, in my experience, the rare exception, even in the early stages of prostatic enlargement. The calibre of the stream is nearly always diminished, to some extent proportionately to its loss of projection. Were this not the case, after the stream is once started many of these cases could empty the bladder as rapidly as in health.

*Interrupted Micturition.*—This symptom, characterized by the partial or complete stoppage of a fairly full stream, the urine either coming in drops or entirely ceasing to flow, followed in a few seconds or minutes by resumption of the free flow, may be caused by movable intra-urethral or intra-vesical projection of the enlarged prostate, which is so influenced by the flow of urine that it obstructs the outlet from the bladder, but when the stream is stopped again leaves the urethra partly patulous. More commonly it is due to spasmodic contraction of the external vesical sphincter and the compressor urethræ muscles, reflexly excited by urethro-cystitis. After the bladder changes are fairly well advanced, it may be caused by intermittent contraction of the detrusor muscles, always a sign of atony.

The physiology of micturition requires continuous contraction of the detrusor muscles and relaxation of the sphincter *for a brief interval* only. When there is sufficient obstruction to triple or quadruple the time normally required fully to empty the bladder, the detrusor muscles, exhausted by their effort, may relax, whereupon the sphincter muscles, relieved of the *vis a tergo*, promptly contract. After some seconds or minutes the detrusors recover sufficiently to make further efforts at evacuation.

*Incontinence of Urine.*—This may always be taken as a symptom of retention with overflow, the intra-vesical tension of the overfull bladder being sufficient to overcome the resistance offered by the tonic contraction of the sphincter muscle plus that due to the prostatic enlargement. Incontinence said to be due to "a peculiar form of hypertrophy of the prostate, in which the enlarged third lobe projects wedge-like between the lateral lobes, keeping the neck of the bladder continuously patulous,"<sup>1</sup> is prob-

<sup>1</sup> Ashhurst's Principles and Practice of Surgery, p. 1015, 1889.



ably as rare as the mechanical improbability of such a symptom from the lesion described would lead one to infer. The statement is based upon the assertion of Mercier,<sup>1</sup> who describes four cases in which the autopsies disclosed this condition, but Thompson (*loc. cit.*), was unable to find any museum specimens which corroborate this statement.

*Complete Retention of Urine.*—Attacks of complete retention are due to an aggravation of the chronic urethro-cystitis accompanied by inflammatory swelling, sufficient when the prostatic enlargement has markedly encroached on the urethral calibre to produce a complete obliteration of the remaining narrow passage. The temporary nature of the retention, and the prompt way in which it usually yields to antiphlogistic treatment, show that the added obstruction is congestive in its nature. It may occasionally, when occurring for the first time, mark the completion of the atrophic process which has finally destroyed all power of contraction in the bladder—more commonly this is preceded by several attacks of retention, with intervals of feeble expulsive power.

*Changes in the Urine.*—In the early stage of prostatic hypertrophy polyuria, slight albuminuria, oxaluria, in fact all the urinary changes characteristic of sexual neurasthenia, are not uncommon. These changes are to be attributed to the reflexes excited by the chronically congested prostatic urethra upon the kidneys or the general system. In spite of marked obstruction and the presence of several ounces of residual urine this fluid may remain perfectly normal for years. When, however, the passive congestion at the base of the bladder is converted by infection into a cystitis the residual urine undergoes ammoniacal fermentation, becomes at times indescribably foul, is loaded with pus, and presents the varied abnormal conditions characteristic of retention and cystitis.

*Sensory Disturbances.*—A sense of urgency on urination, discomfort after the act, dull pains in the perineum, rectum, small of the back, hypogastrium, and along the inner surfaces of the thighs, sometimes passing down to the calf of the leg or sole of

<sup>1</sup> Recherches Anat. Path., Paris, 1841.

the foot, are symptoms dependent upon a congested or inflamed condition of the prostatic urethra, and are not directly due to prostatic enlargement. During the intercurrent acute attacks of inflammation these symptoms are greatly increased in severity.

A sense of perineal fulness, aggravated by pressure in this region, a feeling as though the rectum were stuffed, are the only sensory symptoms directly excited by the enlargement.

*Constitutional Disturbance.*—Even in the early stages of prostatic enlargement, but not before frequent urination and loss of force show that the bladder is experiencing the effects of obstruction, there is often a failure in general health, occasional feverishness, with dry, coated tongue, and loss of mental vigor.

This condition Belfield attributes to early uræmia, and it may certainly be taken as a sign that the kidneys are beginning to feel the effect of the increased intra-vesical tension.

Such a failure of health *antedating* bladder symptoms must be regarded merely as a coincidence, since prostatic enlargement in itself has no effect on the general health. In the late stages of prostatic hypertrophy the patient exhibits the characteristic symptoms of septicæmia and kidney involvement, and perishes from suppression of urine or septicæmia.

It will be seen from the brief resumé of symptoms just given that the only subjective symptoms excited by prostatic hypertrophy are those due to *obstruction* of the prostatic urethra, and the inflammatory and atrophic, and degenerative changes in the urethra, bladder and kidneys resulting from this obstruction.

#### OBJECTIVE SYMPTOMS OF PROSTATIC HYPERTROPHY.

(1) *Residual Urine.*—Is usually considered as characteristic of prostatic hypertrophy. Fenwick has shown, however, that this symptom may be elicited in any form of obstruction, notably in strictures. It is probably due in these cases to tiring of the detrusor muscle before the bladder is completely emptied.

(2) *Digital Examination by the Rectum.*—This shows any

enlargement which has grown downward and backward toward the rectum, and since the hypertrophy is frequently general, or at least involves the greater part of the gland, the finding of a distinct tumor through the rectum strongly suggests prostatic hypertrophy as a cause of obstructive symptoms. Still, this examination gives absolutely no information as to encroachments on the urethral calibre.

(3) *Instrumental Examination.*—In addition to the presence or absence of residual urine, already mentioned, instruments will enable us to ascertain (a) The seat and sometimes the nature of the obstruction, (b) The tonicity of the bladder, (c) Sometimes the condition of the ureters, and inferentially of the kidney pelves.

*The Seat and Nature of the Obstruction* can best be determined by introducing solid steel instruments, or silver, or soft English catheters. If these instruments are arrested at a point more than seven inches from the meatus the obstruction is in the prostatic urethra. If an instrument with a prostatic curve is arrested at the same point, but on continued pressure passes on into the bladder often with a distinct jump; and if a Mercier "elbowed" catheter goes in without difficulty the obstruction is probably one caused by upward projection of the urethral floor, and its distance from the meatus can be measured by the solid sounds. If the moderately stiff Mercier catheter will not pass, but a very small gum catheter, or one of the rat-tail pattern enters, the urethra is probably deflected to one side or the other. If all instruments enter readily, but the outward flow of urine is markedly interfered with, the obstruction is of the valvular type.

The cystoscope sometimes shows plainly the intra-vesical projections of the enlarged prostate, and the urethroscope may demonstrate the seat and the anterior surface of an intra-urethral obstruction.

*The Tonicity of the Bladder* is measured by estimating the force with which the urine is propelled through the catheter. The manometer experimented with by Moullin proved useless.

Examination by means of the finger in the rectum, and a

solid instrument passed into the urethra, may throw some light upon the real extent or nature of the enlargement.

The condition of the ureters and pelves of the kidneys may exceptionally be shown by cystoscopic examination. This is often impossible in these cases, but when practicable the openings of the ureters can be seen, and the periodicity and vigor with which they eject the urine, and at times it may even be possible to pass an instrument into the ureters by means of the catheterizing urethroscope, and by an examination of the urine drawn determine how much damage had been done to the kidney and its pelvis.

Instrumental examination will also determine the severity of the urethrovesical inflammation, and the amount of muscular spasm of the sphincters.

*The Length of the Urethra* is determined by passing a catheter till the urine begins to flow. The position of the meatus urinaris is marked on the shaft of the instrument by the thumb nail, and the instrument is withdrawn, and measurement taken from the thumb nail to the eye. In general hypertrophy there is always an increase in length, and this increase is a rough index as to the extent the vesical outlet is raised above the level of the floor of the bladder. Aside from this, it affords no gauge as to the amount of obstruction.

*Diagnosis.*—Symptoms of obstruction to the free passage of the urine, associated with symptoms of cystitis, when occurring in a man over forty years of age, are generally due to enlarged prostate. If on physical examination there is no obstruction within seven inches of the meatus, if rectal examination shows that the prostate is enlarged, if the urethra is markedly *lengthened*, if soft or coudé instruments pass when Thompson's sounds are arrested, and if there is residual urine, the diagnosis is rendered nearly positive.

Cystitis with atony, vesical calculus, and urethral stricture cannot be confounded with enlarged prostate after careful examination, though all of these conditions may be coexistent; indeed, the first two are very commonly associated with prostatic hypertrophy.

Cancer and tuberculous prostatitis may at first exactly simulate prostatic hypertrophy, but pursue an essentially different course.

The *classification* of cases of hypertrophy of the prostate may be made from various standpoints. The following factors are, however, most worthy of mention as having a direct bearing upon treatment. They should be taken into account in deciding upon the management of any particular case.

(1) *The Predominant Character of the Growth*; whether *soft*, indicating excess of glandular and muscular elements; or *hard*, showing advanced fibroid change. The distinction can be made more simply and accurately by rectal palpation than by any other method.

(2) *The Seat of the Growth*.—From a practical standpoint this is of chief interest in relation to the changes in the bladder. In a general way it may be said that when the enlargement affects chiefly the lateral lobes, the urethra is narrowed and compressed, and the condition is analogous to that existing in organic urethral stricture. The difficulty in urination depends on causes purely obstructive and quite outside of the bladder itself. That organ undergoes, therefore, the usual hypertrophy and thickening of its muscular walls with diminution of the size of its cavity. There is little or no residual urine.

If, however, the growth is median, and projects backward into and beneath the neck of the bladder, or if the lateral lobes are elongated in the same direction, a dam is formed, behind which urine accumulates. The muscular tissue at the base of the bladder, unable to contract properly, atrophies, and thins; the post-prostatic pouch forms and increases. Generally, vesical atony supervenes and often the expulsive power is completely lost, so that in neglected cases the only urine which escapes from the bladder is the "overflow."

These two conditions may be best differentiated during catheterism. In the former, when there is uncomplicated lateral enlargement and vesical hypertrophy, the catheter goes in possibly with difficulty, but without the necessity for great depression of the handle; it does not go to an unusual depth before reach-

ing urine; there is little or no residual urine. In the other variety the presence of the median obstruction is recognized by the difficulty, often the impossibility, of passing an ordinary instrument, the necessity for employing one of larger curve, or with longer shaft, or of using a Mercier or other catheter coudé. There is always some residual urine; often many ounces.

(3) A third and not unimportant classification may be made on the basis of the *presence or absence of general sclerosis*. If this condition is a factor in the case, rigid vessels, arcus senilis, polyuria, hyaline casts, etc., will be associated with the evidence of vesical inability due to rigidity of the bladder walls. The prostatic enlargement will usually be dense and distinctly fibroid.

(4) *Infection of the vesical mucosa*, with pyogenic organisms, is too important to be ignored, and should be mentioned as modifying materially any grouping of prostatic cases. Indeed, it is almost of itself a sufficient basis for classification, and, if we were compelled to rely upon one single factor, might be said with some show of justice to take precedence of all others.

While the above classification cannot be regarded as exhaustive, and while it must be admitted that as to each of the first three groups cases will be found which it will be difficult to place, I believe that on the whole it will prove a distinct help in deciding upon questions of treatment.

These may be considered in the order already indicated.

(1) *In what Cases is a Purely Expectant Treatment Proper?*  
—Only in those in which enlargement has produced no symptoms, and catheterism is easy and shows no residual urine.

Such cases would include chiefly those in which the prostatic condition is recognized during a rectal examination instituted for other purposes. They are not infrequent in my practice. They often occur in comparatively young men. An antecedent history of posterior urethritis should, of course, suggest a chronic prostatitis which may be recognized and treated by the usual not very satisfactory methods.

(2) *Is there any Medical Treatment which is Worthy of Trial?*  
—So far as I know ergot is the only drug which offers any pros-



pect of usefulness, and it must be admitted, first, that it is indicated in only a small proportion of cases, and next, that it is far from demonstrated that it has any distinct effect even then. It was used many years ago on account of the apparent homology between the prostate and the uterus. The recorded results are conflicting, but on the whole decidedly opposed to the theory that it has any specific influence.

I have for years been in the habit of giving it in those cases in which the softness of the prostate seemed to indicate predominance of muscular elements, but have constantly combined it with the bromides, boric acid, belladonna, etc., and with instrumental or other treatment, so that I am unable to draw any definite conclusions, and must confine myself to the statement that in many such instances I have noted enough improvement to make me feel disinclined to discard it. While the medicinal treatment of the prostatic hypertrophy itself is thus unsatisfactory, some of the complications may undoubtedly be benefited by the administration of drugs, notably cystitis, which will always improve markedly under the use of boric acid or salol in conjunction with belladonna and the bromides. The subject is, however, beside the main purpose of this paper, and may be dismissed with the remark that on the one hand much harm is often done by the general practitioner who, with his usual remarkable faith in drugs will frequently in these cases neglect more efficient treatment, while on the other hand the surgeon too often ignores the urinary antiseptics, which are certainly of value in many cases.

(3) *When Should Palliative Treatment be Employed?*—Palliative treatment consists (a) in the systematic use of steel sounds or other instruments for purposes of dilatation; or (b) in the employment of the catheter, and is of the greatest value in a very large number of cases.

The indications for its employment are as follows:

(a) *Dilatation.*—A patient who presents the symptoms of the prostatico-vesical congestion of the early stages of hypertrophy, who is disturbed once or twice at night, who has an enlargement of moderate density, appreciable through the rectum, but not offering much resistance to the introduction of an ordinary



catheter, and who has but little residual urine, is likely to derive great benefit from the systematic introduction of full-sized steel sounds. I have always under observation a number of such patients in whom this treatment and this alone seems to relieve existing symptoms and to prevent or, at least, delay the development of further trouble. That it can have any true curative effect is unlikely; that it can even modify to any extent the continuous enlargement of the gland seems improbable, but that, either by producing a local atrophy in the parts immediately surrounding the urethra, or by simply stretching the canal itself and relieving local congestion and tumefaction, it mitigates the early symptoms, lessens the vesical irritability, diminishes the amount of residual urine and modifies favorably the whole course of the case, seems to me beyond all doubt, and I base my opinion upon a fairly large experience extending now over nearly twenty years.

Harrison<sup>1</sup> revived professional interest in the method in 1882 by his publications on the subject, recommending specially-shaped instruments with a bulbous enlargement a short distance from the tip. In carrying it out I prefer to introduce about every fifth day the largest steel sound which the membranous urethra will permit to pass, and of allowing it to remain in place for ten to fifteen minutes, or longer if the patient is in bed. Careful sterilization of the instrument and gentleness in its introduction render the treatment absolutely free from objection, and intelligent patients carry it on for themselves for years.

The psychrophor, cold rectal douche, etc., while sometimes of great use in chronic inflammatory conditions of the prostate, have seemed to me to have no effect whatever upon cases of hypertrophy.

(b) *Catheterism* should be systematically employed in cases in which the quantity of residual urine is three or four ounces or more, and in which the introduction of the instrument is easy and painless, and the urine is sterile. The frequency should be proportionate to the amount and character of the residual urine, a very good working rule (if the urine is sterile) being to use the

<sup>1</sup> Brit. Med. Journ.

catheter once daily (preferably at bedtime) for three ounces, twice for six ounces, and then once more for any additional two ounces. With sterile urine it is rarely necessary to use it oftener than once in every four hours.

The objections to habitual catheterism in prostatics are (1) the risk of vesical infection; (2) the production of vesical atony. These are very real and very serious, although not sufficient to contraindicate the employment of the method. The first may often, but not always, be avoided by scrupulous and unflagging care as to asepsis. The second is unavoidable, and this fact should be regarded as weighing in favor of operation in all cases where it comes up for consideration.

In the selection of a catheter the softest and smallest that will answer the purpose are usually preferred. This is often absolutely necessary in nervous patients who shrink from the least pain, and who dread the procedure and avoid it as long as possible. It is also proper in unintelligent and clumsy persons, who cannot be taught the use of a solid instrument.

In all others in whom a silver catheter will pass without exciting bleeding or undue pain, it should be the instrument of choice, and should be left *in situ* for a few minutes on each introduction, the point being withdrawn just enough to avoid contact with the wall of the empty bladder.

The largest size that the canal will admit should be used. By this means a certain amount of dilatation is kept up, and I am led by my experience to believe that the progress of the case is favorably influenced. In patients who have faithfully carried it out it has seemed to me that the obstructive condition remained *in statu quo* longer, and was on the whole less pronounced, than the average cases employing the soft instruments.

In those patients who do not present themselves until the introduction of a metallic instrument has become impossible, the choice of catheter lies between the Mercier and the Nélaton, either of which may be used in accordance with the comfort of the patient.

When cystitis is present, its treatment should be conducted on the usual lines, urinary asepsis being the object aimed at.

In those cases of vesical atony in which the obstructive element is not pronounced, or has been removed by operative procedure, electricity might be expected, on *a priori* grounds, to be of much benefit. It doubtless would be if the accompanying conditions were similar to those existing in a case of atrophy of a muscle or a group of muscles of an extremity, but unfortunately the electrode cannot be applied with the same ease or certainty; the additional instrumentation is often objectionable. It is not uncommon to find the application of a current sufficient in power to be therapeutically active, followed by vesical irritation; the intervals necessitated by such intolerance are often so long as to render the treatment futile, and, altogether, at least in my hands, the method has been unsatisfactory.

In those cases in which atony is the predominant condition it should always be tried, but will, I believe, give good results in a very small proportion.

Strychnia has a certain value in these same cases, and should be administered in full doses.

(4) *In what Cases should some Operative Procedure be Recommended?*—It may be said at once that in those patients with but moderate obstruction, or with a high grade of compensatory hypertrophy of the bladder, with a small amount of residual urine, which remains sterile, and in whom catheterism is easy and painless, operation is not to be thought of.

The time may come when by perfecting our methods of diagnosis, and our operative technique, this class of prostatics may be benefited by active surgical interference, but it has not yet arrived. Dilatation and catheterism, as above described, at present represent the best therapeutics, and if the rigid observance of details of antisepsis is emphasized, insisted upon, and never lost sight of, will in a fair proportion of instances see the patient comfortably through his life.

But it must be said with equal positiveness that in the great majority of cases it is at the termination of this stage, when the approaching "break down" in catheter life first begins to manifest itself, when instrumentation becomes more difficult, more painful, or more frequent, when the urine shows fermentive

change, and the vesical congestion merges into a true cystitis, that the most valuable time is lost to both patient and surgeon. It is just then that on the one hand operation is for the first time clearly indicated and justified, and on the other that it promises most.

Unfortunately, the great majority of prostatics are not led to consider operation until long after this period, when we have unimpaired general health with pronounced local symptoms, has passed. They are brought to us as a rule only when vesical and renal infection is pronounced, and when the characteristic toxæmia,—a combination often of sapremia, septicæmia, and chronic uræmia—has supervened, and is of itself threatening life. Operation may then be forced upon us, but of course with far less prospect of success.

Its full capability of usefulness can never be determined until it has become customary with the general practitioner to refer such cases to the surgeon at an earlier period, and until the latter has unreservedly recognized the possibility of good which operation then affords.

I have no hesitation, however, in saying that in the absence of evidence of advanced and threatening renal disease of an infective character, but few prostatics, no matter how marked their local symptoms, should at the present day be denied the chance of relief afforded by operation. In this statement I would include not only the cases with pronounced vesical sepsis, but also those with atony; with more or less complete retention; with general sclerosis, rigid vessels, polyuria, and hyaline casts; with even the toxæmia above alluded to. The evidence already presented to the profession seems to me to warrant this opinion, in spite of the unfavorable views as to operative interference formed and expressed by such excellent and experienced observers as Socin, Guyon, and Sir Henry Thompson.

The *mortality* in all forms of prostatectomy has varied from 13.6 (perineal) to 25 per cent. (supra-pubic); while perineal prostatotomy has a mortality of but 4.5 per cent. In considering these figures it must be remembered that many of the cases presented all the unfavorable symptoms which have been mentioned,

and that few cases have as yet submitted to operation at an early date. The wretchedness of the life which awaits such patients certainly renders operative risk justifiable. In a collection of thirty-three supra-pubic prostatectomies, in which there were seven deaths, all the patients but four were over sixty; eight were over seventy; almost all were in wretched health, many, as stated by one operator, were "obviously within a few days or weeks of death unless speedily relieved;" another says: "the cases were not selected, except that all mild cases were refused operation, and no desperate case was denied the chance, and of these several were nearly dead when taken in hand."

Moullin's table shows nineteen deaths in ninety-five cases of supra-pubic prostatectomy, a mortality of about 20 per cent.; but the last half of the table (which is arranged chronologically) shows only 15 per cent. This is in accord with the history of nearly every important operation now performed by surgeons. With increased experience comes better judgment in the selection of cases, and greater facility in operative technique.

It is evident that we have not yet the data for estimating the true mortality of operation in those cases in which the more serious contra-indications are absent, but it is certain that it would be much less than has as yet been attained. It is also certain that the possibility of serious disease of the urinary tract above the bladder increases in every case in a direct ratio with the duration of obstructive disease anterior to that organ. Indeed, we know that even frequency of micturition is of itself a competent cause of urethral dilatation, hydronephrosis, etc.; and when to these factors are added the grave vesical changes which follow infection and retention, it seems strange that renal disease is ever absent in patients with long-standing prostatic enlargement.

(4) *The Choice of Operation.*—I may briefly mention, for the sake of completeness, those methods which, in my opinion, are at present to be rejected, either on account of lack of evidence of favorable results, or because the recorded testimony of competent observers is distinctly unfavorable. They include interstitial

injection of iodine, ergotin, carbolic acid, sclerotic acid and other substances (Heine); the application of a continuous current through the negative pole inserted into the body of the gland through the rectum, the positive pole being applied to the abdomen (Bidert, Casper, Roux); the application of the galvano-cautery to the mucous membrane of the prostatic urethra by means of instantaneous flashes (Newman); the division of the bar at the neck of the bladder by means of a cutting instrument inserted through the penile urethra (Mercier, Gouley); a similar section at the neck of the bladder by means of the electro-cautery (Bottini).

I do not mean to say that there is no possibility of usefulness in these plans. It may even be that some of them contain the germs of what is destined to be the approved and successful treatment of the future. At present, however, the evidence points in the contrary direction.

This leaves for consideration the following methods, which will be mentioned in the order of their gravity, as estimated by their probable risk, or by their mortality as determined by existing statistics.

(1) *Over-stretching of the Prostatic Urethra*.—This procedure is not likely to be followed by good results in cases in which the median lobe and the vesical neck are chiefly concerned. In those of lateral hypertrophy, in which the urethra is simply narrowed, or is narrowed and rendered tortuous, it might be of use. If it is tried it should certainly be conducted under ether, and should be carried to the furthest degree consistent with safety. I have often thought of following the suggestion made by Physick, early in the century, as to the use of what he called "hydraulic compression," for which he invented a special instrument, or of repeating Sir Henry Thompson's experiments with a hydrostatic dilator which were made nearly forty years ago, but I have never done so.

Thompson dismissed the whole subject in his later publications with the remark that no one of experience now ventures to use instruments sufficiently large to produce any diminution of the gland or any dilatation of the canal which passes through it,



by the agency of compression, on account of the probability of exciting prostatitis. He rejects, too, the idea that by this agency any beneficial effect on the gland is possible. It must be remembered, however, that this opinion dates back to the time when antisepsis in genito-urinary surgery was unknown and unthought of. Undoubtedly this mode of treatment, with the slight bruising of the gland and the minute lacerations of the mucous membrane produced by it, favored the development of an infective inflammation, and this was probably the cause of the "aggravated suffering" which Thompson describes as following dilatation. I do not mean to deny the possibility of exciting a traumatic prostatitis, but would regard that risk as one which might well be assumed by both patient and surgeon if the method lessened the obstruction, which is the chief cause of all the gravest symptoms. The atrophy of the prostate following stricture of the urethra is well known, and is asserted by Thompson himself to be due to pressure.<sup>1</sup> I have been led to bring this subject forward because my experience with the simpler dilatation by means of ordinary sounds, seems to me to justify hope of greater good from more thorough treatment conducted on the same lines. I have, however, included it among operative instead of palliative measures, because it is a more formal procedure and aims at further-reaching and more permanent results. A still more radical application of the same idea has been suggested by Bangs, viz., the dilatation of the prostate through a perineal incision. This also has not been tried in a sufficient number of cases to warrant a final opinion.

The theoretical advantage of a hydrostatic dilator would be the uniform pressure exerted on the whole circumference of the prostatic urethra and vesical neck, with less risk of dangerous laceration of the mucous membrane than by the metallic dilators.

The operation may be said to be indicated (tentatively or experimentally) in those cases in which palliative treatment has failed and more radical measures are declined.

(2) *Perineal Prostatotomy*, in the simplest form, as to the usefulness of which we have any satisfactory evidence, consists in

<sup>1</sup> Loc. cit., p. 118.



opening the urethra at the apex of the prostate by a median perineal incision, and dividing the obstructing portion of the gland by means of a probe-pointed bistoury, cutting from within outward. The channel may be further enlarged by division with the finger.

This operation, described by Harrison as a suggestion of Guthrie's, and as combining Cock's operation for opening the urethra with Mercier's for division of the "bar," is of little use unless the further suggestion of Harrison be also adopted, and prolonged drainage by means of a large-sized tube worn continuously for weeks be regarded as an essential factor of the procedure. Of eleven cases (Moullin's tables), in which this, or a closely similar method, including continuous drainage, was employed, six were "cured" and two "much improved."

The mortality from perineal prostatotomy, according to the same statistics, is 1 in 24 (4.5 per cent. approximately); and in the fatal case the patient, who was eighty years of age and in whom the bar at the neck of the bladder had been freely divided, died of uræmia.<sup>1</sup> The operation should be regarded as that of choice in all those cases in which with marked diminution of expulsive force and with cystitis there are also evidences of widespread degenerative changes or of distinct renal disease, and toxæmia and general feebleness are present. It is also to be preferred as a rule even in the absence of renal or constitutional symptoms if the bladder is rigid and contracted, and will hold only a few ounces of urine, or if the atony is nearly absolute and does not tend to improve under careful treatment.

The precise mode by which it acts has not been demonstrated, but it seems probable that it is a combination of mechanical dilatation of the channel with a certain amount of cicatricial contraction in the substance of the gland, reducing its bulk in the immediate vicinity of the urethra and thus diminishing its obstructive power.

(3) *Perineal Prostatectomy*.—As a more or less accidental accompaniment of lithotomy, projecting portions of the prostate being caught and extracted with the calculus, this operation has

<sup>1</sup> Wishard, American Journal of the Medical Sciences, November, 1890.

been for years familiar to the profession. As a formal procedure it is more recent. Moullin's tables contain fourteen cases with two deaths, one failure and eleven "cures," a mortality of 14.3 per cent. The chief clinical indications for the operations may be said to be those already enumerated as justifying prostatotomy, which may always be converted into a prostatectomy if the perineal distance permits the growth to be reached by the finger and it is found to be of small size, and limited to the median line posteriorly, or pedunculated and acting like a ball-valve at the neck of the bladder.

The latter condition may be suspected if in an old man, without marked prostatic symptoms and with no calculus, sudden and complete retention comes on, and still more especially if there has been sudden stoppage of the stream during urination, and if in spite of these symptoms catheterism is not difficult.

The projecting portion may be seized by the finger or forceps, or caught with a wire, or with a galvanic ecraseur, and removed. The results, as above stated, have been remarkably good.

The chief objections to the method as a formal procedure, when a radical operation has been determined upon, are that in only about one-third or one-fourth of the cases (Watson, McGill) could the growth be reached by the finger of the operator; that often even when accessible to the finger it cannot be satisfactorily dealt with through the narrowed urethra; and that vesical projections are altogether beyond reach for accurate or careful manipulation.

(4) *Supra-pubic Prostatectomy* is the operation to be preferred in all those cases in which, palliative treatment having failed, there are unmistakable indications that the local conditions are growing worse, the general health remaining as yet unaffected.

The best possible period is that before the development of marked and continuous cystitis, while some power still remains in the vesical walls, and the bladder is neither thinned and dilated nor rigid and contracted.

Under these circumstances, in the presence of a patient who

reports that he is disturbed at night with increasing frequency; that he is obliged to use the catheter oftener, and not only does so with greater discomfort, but with less relief in the interval; that the urine is occasionally turbid and offensive; that he has recently had one or more attacks of retention; and that he is beginning to lose flesh and appetite, it appears to me that the indications for operative interference are unmistakable, and that the supra-pubic method is obviously the one to be selected.

It permits in every such case a thorough manual and visual exploration of the bladder, and a digital exploration of the prostatic urethra, and is, therefore, if for no other reason, to be preferred to the perineal method. The difference in mortality, if we may venture to compare the last half of Moullin's table of supra-pubic prostatectomies (which comes nearest it in dates) with his table of perineal operations, is not a very serious one, showing for the supra-pubic operation seven deaths in forty-seven cases (operated on since June, 1889), a mortality of 14.9 per cent.; and for the perineal operation two deaths in fourteen cases (operated on with one exception since June, 1891), a mortality of 14.3 per cent. The difference in results cannot be numerically compared, but it may safely be asserted that it is altogether in favor of the supra-pubic method.

In a certain proportion of cases, as might be expected, the bladder does not recover its power, but this proportion in the series above mentioned was only about 20 per cent. It would certainly be still less if earlier operation were insisted upon. It must be understood that even when the loss of expulsive power continues there is often so much gain in the matter of comfort, in the lessening of the cystitis, in the facilitation of catheterism, etc., that the operation should be regarded as essentially a success, even although a complete cure has not been obtained.

Recurrence of the growth after the more radical operation has not happened with sufficient frequency to make it a matter of any practical importance, having been noted in less than 1 per cent. of the recorded cases.

Dittel's operation of lateral prostatectomy has been used by Kuster in three cases with a moderate degree of success. It seems applicable only to those patients in whom the obstruction depends upon enlargement of the lateral lobes, and in whom at the same time the small size of the bladder, and the rigidity of its walls prevent the supra-pubic operation.

In a number of cases (Schmidt, Guyon, McGill, Belfield), various forms of obstruction due to *sub-urethral* prostatic growth have been found, and have either rendered the supra-pubic operation a failure, or have required special operative measures for their relief. There seems no reason to question the propriety in every case of supra-pubic prostatectomy, of examining the prostatic urethra with the finger, and of performing perineal urethrotomy if a hard mass or a rigid ring is discovered (Belfield). This admits of thorough stretching, of incision, or of excision, and adds but little, if at all, to the dangers of the case.

As to the technique of the supra-pubic method, the adoption of Trendelenberg's position; the omission of the rectal bag; the arrest of hæmorrhage by an internal pad held in place by a string carried through a perineal incision (Keyes); and the use of an ecraseur introduced through the urethra, the mucous membrane over the growth being incised, and the wire being guided to its proper place through the usual supra-pubic incision, are the modifications most worthy of mention. The latter suggestion seems to me worthy of note as enabling us in desperate cases to reduce the hæmorrhage to a minimum, and to remove only that portion of the prostate which is really obstructive. I called attention some time ago<sup>1</sup> to the fact that the risk of hæmorrhage, of shock from prolongation of the operation, of sepsis from the exposure of a larger absorbent surface, are all directly increased with the amount of the prostatic overgrowth which is removed, making it most important that we should know how *little* we may do with a reasonable prospect of resulting benefit. In two of the three deaths set down by McGill as directly due to the operation, large portions of the prostate had been taken

<sup>1</sup> Medical News, December 13, 1890.

away, and I have had the same experience. That age, with its associated debility, is not the chief factor in causing death is shown by the fact that of ninety cases, in which the age is given (Moullin), the average was sixty-four and one-half years, while of eighteen fatal cases the average was only sixty-six and one-half years. The difference is not great enough to warrant the assumption that age is of primary importance in determining the mortality. It must not be forgotten that the object of the operation is to restore a "low-level channel" through the prostate, and is not simply the excision of the overgrowth (Belfield). Moullin says that practically, if the operation is to prove successful, it resolves itself into removing the whole of the vesical mass, whether it springs from the lateral lobes, or is an upgrowth from the posterior wall, or is a detached nodule. This may be true, but it has certainly not yet been demonstrated. Every surgeon who has done a number of tonsillotomies is familiar with the remarkable diminution in size of that gland which may follow the removal of a comparatively trifling portion. It may be found that similar contraction of the prostate will result from the removal of merely the most salient portion. If so, it would undoubtedly lessen the mortality, and greatly promote the general acceptance of the operation. The lessening in the size of the prostate, which in a number of instances has followed Harrison's operation of puncture of the post-prostatic pouch with a trocar and canula, and to which I have already alluded, seems to have some bearing upon the question. In some of his cases after withdrawal of the tube normal micturition was re-established.

Two cases in my own experience (one of them not yet published) illustrate this point excellently. In one, a patient aged sixty-eight years, with complete loss of expulsive power for four years, with a violent cystitis, marked renal disease, a vesical calculus, a mitral murmur, and other evidences of degenerative changes, I was led by the enormous size of the intra-vesical growth to remove successive portions until I had taken away eight, varying in size from that of a hickory nut to that of a large walnut, and weighing altogether three ounces. The patient did well

for three and a half days, then developed uræmic delirium, and died of suppression of urine on the seventh day.

The other case, a man of sixty-six years of age, was in much the same condition. He had passed no urine voluntarily for more than three years; he was using or attempting to use the catheter every half hour, was suffering intensely all the time and was rapidly emaciating. He also had intense cystitis, albumen and casts in the urine, pipe-stem radials, etc. The bladder was so thin that on attempting to make its wall prominent in the wound to facilitate incision, by means of a silver prostatic catheter, the point of the instrument perforated it, an accident I had never seen before.

In this case I contented myself with the removal of small portions of prostate immediately around and beneath the vesical orifice, freeing that completely, but paying no attention to the lateral lobes. The patient made an uncomplicated recovery, and is now using the catheter painlessly and never more than five times in the twenty-four hours. He sleeps six hours without awaking, and is markedly improved in general health. The enlargement in his case was not unlike that in the other, involving the whole gland and extending into the bladder.

The improvement is so disproportionate to the extent of my interference with the growth, that I am convinced it is partly due to subsequent contraction of the remaining portions of the gland. Of course in this case there has been no recovery of expulsive force, but I do not believe that any operation, however extensive, could have brought that about. The case has impressed me anew with the desirability of learning the minimum amount of interference which will be effective.

(5) I have one further thought which I have decided to mention to this association, although I do so with a reluctance born of the fear of being considered illogical or impractical, or perhaps both. It occurred to me some time ago that possibly, if the analogy between uterine fibro-myomata and prostatic overgrowth was a real one, castration might have the same effect upon the latter that oöphorectomy does upon the former, and cause a shrinkage or atrophy which would result in the practical



disappearance of the obstruction. At the time I had never heard or read of the alleged prostatic atrophy in eunuchs, geldings, etc., which I have already mentioned. While I was unaware that any allusion even had been made in medical literature to this subject, I instituted a series of experiments, which were carried on for me by Dr. E. R. Kirby, of the University of Pennsylvania, and the results of which are subjoined. The microscopic specimens are here for examination by the members of the association.

In the experimental work dogs were used partly for convenience, partly because it is known that in this animal the prostate occasionally undergoes changes similar to those which are found in the human prostate.

The literature was carefully looked up, and no reference as to the average or normal weight of the prostate in dogs could be found.

For control experiments thirty-five dogs and their prostates were weighed, and the average weight taken as a standard. The average weight of the prostate was found to be 15.3748 grammes. The relative weight of the prostate to the weight of the dog was also taken into consideration and is given in each case.

The dogs were castrated and killed at different intervals. The prostates were hardened in alcohol, cut by the freezing celloidin method, stained with borax carmine, and mounted in Canada balsam.

No. 19. Weight of dog 15 kilos. Average weight of prostate in dogs, weighing from 14 to 16 kilos inclusive, 15 grammes. Dog killed at the end of 17 days; weight of prostate 5.420 grammes. In this specimen the normal relation of the different structures seems to exist. No change noted.

No. 21. Weight of dog 14 kilos. Average weight of prostate in dogs weighing from 13 to 15 kilos inclusive, 13 grammes. Dog killed at the end of 21 days; weight of prostate 5.700 grammes. In this specimen beginning changes in the glandular structure are seen. The muscle fibres show but little change. From this it would seem probable that the glandular elements are the first to undergo atrophy.

No. 20. Weight of dog 14 kilos; 30 days; weight of prostate 2.600 grammes.

The glandular structure shows well the beginning atrophy. The glands are irregular in outline, smaller than normal and separated from each other by considerable connective tissue. Very few muscular fibres are to be seen.

No. 4. Weight of dog 20 kilos. Average weight of prostate in dogs weighing from 19 to 21 kilos inclusive, 19 grammes; 32 days; weight of prostate 2.620 grammes. The picture is here about the same as that seen in No. 21.

No. 16. Weight of dog 15 kilos. Average weight of prostate in dogs weighing from 14 to 16 kilos inclusive, 14 grammes; 41 days; weight of prostate 5.700. In this specimen the glandular elements are but slightly atrophied, especially in some places. Many muscular fibres can be seen, all, however, atrophied.

No. 13. Weight of dog 31 kilos. Average weight of dogs weighing from 29 kilos upward, 30 grammes; 54 days; weight of prostate 4.420 grammes. Atrophic changes well marked. The connective tissue elements predominating.

No. 14. Weight of dog 23 kilos. Average weight in dogs weighing from 22 to 24 kilos inclusive, 21 grammes; 54 days; weight of prostate 2.700 grammes. The glands show somewhat better in this specimen, but are widely separated from each other by bundles of connective fibres, and the longitudinal stripes are well marked.

No. 24. Weight of dog 15 kilos; 60 days; weight of prostate 1.500 grammes. Presents practically same picture as No. 13.

No. 9. Weight of dog 22 kilos. Average weight of prostate in dogs weighing from 21 to 23 kilos, 21 grammes; 61 days; weight of prostate 4.000 grammes. Here and there in this specimen may be seen masses of closely-packed cells, evidently the remains of the glands. Few muscular fibres can be made out. Longitudinal stripes well marked. No nuclei to be seen.

No. 8. Weight of dog 25 kilos. Average weight of prostate in dogs weighing from 21 to 29 kilos, 21 grammes; 65 days; weight of prostate 4.500 grammes. There is considerable atrophy of both the glandular and muscular elements, connective tissue predominating.

No. 5. Weight of dog 26 kilos; 72 days; weight of prostate 3.920 grammes. In this specimen but little of the glandular structure remains. What gland acini can be seen are very small and irregular in outline. There are but few muscular fibres to be seen, and their outline is not sharply defined. No nuclei can be seen.

These results, which I believe may be relied upon, place beyond all peradventure the influence of castration (in the dog at least) upon the condition of the prostate, and show clearly that that operation is followed invariably, and with a promptness which I must confess was to me surprising, by atrophy first of the glandular and then of the muscular elements, and by a coincident reduction in both bulk and weight. Since instituting them I have become familiar with Griffiths'<sup>1</sup> admirable papers, and have learned from them the following facts:

John Hunter observed that in the mole the prostate gland in winter was "hardly discernible, but in the spring becomes very large and filled with mucus."<sup>2</sup> Owen confirms this, and adds that "the prostate gland in the mole begins to increase in February and acquires an enormous size and conceals the urinary bladder toward the end of March." Owen found similar changes in the prostate of the hedgehog. Griffiths examined for himself the generative organs of the mole and the hedgehog in and out of the rutting season, and found the above observations to be correct. He made a number of sections of the gland in the quiescent state, and others during the period of sexual activity. During the former period he found it composed of a few tubules lined by flattened and small epithelial cells, undoubtedly functionless as regards the production of any secretion, but possessing the power of reproducing glandular epithelial cells at the appropriate period. Precisely similar phenomena were observed in the seminiferous tubules of the testicle, and in both the changes were preceded by an increased vascularity of the whole tract, determining an increased growth of all the glands and parts concerned in generation.

As to the effects of castration, Hunter<sup>3</sup> again was the first

<sup>1</sup> *Journal of Anatomy and Physiology*, Vols. XXIII and XXIV.

<sup>2</sup> Works edited by Palmer, Vol. IV, p. 29.

<sup>3</sup> Works, Vol. IV, p. 30.

to note that while the prostate of the perfect bull is soft and bulky, that of the castrated animal is "small, flabby, tough and ligamentous."

Griffiths contributes four observations of his own, two in the dog and two in the cat, the castration having been performed for other reasons years before, in all of which the prostate had been transformed into a mass of fibrous connective tissue containing the remains of the once active gland tubules with a small number of atrophied muscle fibres. He also examined the generative organs of the pig, bullock, sheep and horse after castration, and found that in each case like changes had supervened.

I learned further that Gruber<sup>1</sup> had observed marked atrophy of the prostate in a man of sixty-five who had been castrated in early youth; that Bilharz, in a thesis on "The Anatomy of the Genital Organs of Two Ethiopian Eunuchs"<sup>2</sup> confirmed Gruber's observations, and that Pelican,<sup>3</sup> in a book devoted to the study of a peculiar sect in Russia, says that the prostates in eunuchs are about the size of those found in children.

Furthermore, Civiale<sup>4</sup> has noted the fact that in doing a lithotomy on a man who had undergone complete castration for the cure of a double hernia, he found that the prostate had practically disappeared.

In a case of arrested growth of the external genitals, including the penis, scrotum, and testicles, so that in a man of thirty-three years of age they were only of the size of those of a boy of six or seven years, rectal examination showed that nothing more than a transverse ridge could be felt in the position of the prostate. Micturition was normal.<sup>5</sup> In cases of sterility in the male, it has been noted by Harrison that the prostate was atrophied.<sup>6</sup>

Let me now briefly marshal the facts which bear upon the affirmative side of this question.

The uterus and the prostatic vesicle originate from allied

<sup>1</sup> Mutter's Archiv., 1847, S. 469.

<sup>2</sup> Berlin, 1859.

<sup>3</sup> Skopzenthum in Russland, 1875, S. 99.

<sup>4</sup> Traite pratique sur la Mal. des Org. Gen. Urin., tom. II, p. 338.

<sup>5</sup> Griffiths, op. cit.

<sup>6</sup> International Encyclopædia of Surgery, Vol. VI, p. 388.

portions of the embryonic structures, the Müllerian ducts, and the uro-genital sinus, the glandular portion of the prostate itself springing from the mucous membrane of the latter.

I am not arguing for absolute homology between the prostate as a whole and the uterus. This is denied by most modern authorities on apparently good embryological grounds. The important point to establish is that the prostate is essentially an appendage of the genital, and not of the urinary, apparatus, and this is certainly demonstrated by its origin, its absence in the female, the facts of comparative anatomy, and the observations above quoted.

As to its gross anatomy and pathology, it is made up largely of the same tissue as the uterus, and is subject to the same varieties of morbid growths occurring at parallel periods in the life of the individual.

The uterine tumors do not appear after the menopause, or if present already undergo atrophy. After a certain period of life there is no increase in the tendency to enlargement of the prostate, but rather the reverse.<sup>1</sup>

In the female, oöphorectomy causes a disappearance of these growths, and an atrophy of the uterus itself. Castration almost certainly has the same effect upon the normal prostate in our species, and I have experimentally demonstrated that it has such an effect in dogs.

It remains to ask :

(1) Does this evidence warrant us in believing that castration in cases of hypertrophied prostate would be followed by a disappearance or diminution of the growth ?

(2) If so, is it likely that the fact can ever be taken advantage of as a therapeutic measure ?

In answer to the first question, it may be said that one important piece of evidence is lacking, the absence of which renders incomplete the parallelism between the uterine and prostatic growths.

We have no recorded instances of the spontaneous shrinking of an hypertrophied prostate after the patient has reached a certain age.

<sup>1</sup> Desnos. Dict. des Sct. Med. 2 Series, tom. XXVII, p. 506.

In reply, however, it may be stated that there is no definite or fixed period in the male at which the sexual life culminates and begins to wane, and after which procreation becomes impossible; and, further, that we have no knowledge whatever of the relation of cases of prostatic enlargement to the sexual function. That it may cause erythism, or unnatural sexual excitability, on the one hand, or may be associated with a form of impotence or of sterility on the other, is of course recognized; but the true relation of the growth to the period of functional activity, the secretory life of the testicles, is absolutely and entirely unknown.

Moreover, what may be called the accidental concomitants of the condition—accidental in the sense of being due to anatomical propinquity—the vesical and renal changes, usually cause death in the very cases which might otherwise demonstrate the truth of the theory, those subjects whose advanced years might of themselves through sexual failure prove curative.

An examination of Messer's tables, founded on a dissection of 100 prostates in men over sixty years of age,<sup>1</sup> discloses one interesting fact in this connection. Assuming arbitrarily that eighty may be taken as the age at which, in the great majority of men, the sexual life is absolutely and finally ended, we find that among those subjects whose prostates weighed over 6 drachms, the percentage of octogenarians or their elders was only 22.8, while among those whose prostates weighed less than 6 drachms (many of them less than normal), the percentage was 35.3, more than half again as great.

This is not only confirmatory of Desnos' observations, already mentioned, that after a certain period in life the frequency of notable hypertrophy diminishes, but it suggests the possibility that in many of these cases physiological atrophy had already begun. The subjects were not selected from among patients, but just as they happened to come within reach of the investigator.

The uncertainty as to the exact duration of sexual life in the male also weakens the force of the statement that the con-

<sup>1</sup> Med. Chir. Trans., Vol. XLIII, p. 147.



dition does not manifest itself until after the period of life when it should occur if it were truly homologous with the uterine growth. In addition, it may be said that there is accumulating evidence that prostatic hypertrophy begins much more frequently than was formerly supposed during middle life, and that the statistics on which we have been accustomed to rely, based on museum specimens and on the experience of surgeons to whom the patients apply only when distinct subjective symptoms have developed, are to an extent unreliable.

I do not desire to be understood as insisting upon the truth or even upon the probability of the above hypothesis. I have simply, with much hesitation, determined to follow out publicly a line of thought that had occupied my mind at odd times, and to submit it to your criticism.

As to the second question, the possibility of employing castration as a therapeutic method in prostatic hypertrophy, I imagine that the final answer must be left to our patients.

Of one thing I am convinced, however, that if we ever reach a point in certainty of knowledge in this direction comparable to that already attained in regard to oöphorectomy in relation to uterine fibroids, and can promise equivalent results, there will be no lack of cases willing to submit to an operation almost painless, with a low mortality, and followed by no such unpleasant conditions as accompany persistent fistulous tracts, either suprapubic or perineal, even although the operation carries with it the certainty of sacrificing whatever sexual power has survived the excessive and often intolerable sufferings of such patients.

I might admit finally that I have not had the courage of my convictions, and have never seriously sought to recommend the operation, but it would be truer to say that I have as yet no definite convictions, and that I am simply seeking enough light upon the subject to convince me either that it is worth pursuing further, or, on the other hand, that it offers no possibility of practical usefulness.

## A CONTRIBUTION TO THE SURGERY OF THE RECTUM.<sup>1</sup>

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IN complying with the request of the President to introduce for discussion the subject of rectal surgery at this meeting of the American Surgical Association, I have understood that my task was to be rather an account of my personal work than an academic representation of the present status of this discipline as practiced at the various centres of surgical endeavor. I have caused a computation to be made of the number of cases of rectal ailments treated during the four years ending January 1, 1893, in the surgical service of Mount Sinai Hospital, New York. The facts brought out of the records by Dr. Brodhead, the house surgeon, are to serve as the substratum upon which are based the conclusions and opinions here expressed.

During the four years mentioned 557 patients suffering from rectal ailments were admitted to Mount Sinai Hospital. The largest proportion of these, 280, were classified under the diagnostic heading of hæmorrhoids. Next in frequency were cases of fistula, which, including in their number the more acute forms of ischio-rectal trouble leading to fistula, were 167. After fistula, carcinomata of the rectum, 17, were most numerous; then came 11 cases of prolapse, 6 cases of cicatricial stricture, 6 cases of chronic ulcers of the rectum, 7 cases of polypus, 1 case of multiple adenoma, 2 cases of congenital atresia of anus, and 1 of the rectum; finally, 4 cases of anal fissure.

<sup>1</sup> Read before the American Surgical Association, May 31, 1893.

## HÆMORRHOIDS.

I have derived the impression, from a service extending over about thirteen years at Mount Sinai Hospital, that anal and rectal ailments are very prevalent among the Russian and Polish Jews, who make up the bulk of our patients there. And among these complaints hæmorrhoids are the most common. Of 280 cases, 14 were not subjected to any operation for various reasons. Of the 266 patients operated on, 156 were treated by the clamp and cautery, 63 by the old method of ligaturing and ablation, 47 by the method of excision and suture, simultaneously devised by Dr. F. Lange, of New York, and Whitehead, of England, and finally in 6 cases the nodes were simply incised for the evacuation of a clot.

As to the indications followed in the selection of one or another mode of procedure, the following may be said: In recently developed and moderate cases a systematic depletion of the portal circulation by saline laxatives, aided by cooling enemata and the external application of an ice-bag, were often found to be sufficient to remedy the evil. Where a prolonged prevalence of a morbid state, and frequent recrudescences of acute inflammation have brought about lasting changes in the terminal area of the hæmorrhoidal veins, an operation was deemed necessary.

Decided preference was given to the clamp and cautery method, which was always chosen in the absence of a special indication in favor of another method. Where the element of time weighs as heavily as it does in the overcrowded operating room of our hospital, the clamp and cautery have great advantages. After a thorough stretching of the sphincter, preceded by a sufficient preparation of the gut by adequate laxatives, this process has given us invariably satisfactory results. Not once was there a disagreeable complication observed, nor a faulty result noted, and the patients suffered very little inconvenience or pain. A perfect evacuation of the bowel and a thorough stretching of the sphincter are the conditions upon which mainly depends the patient's comfort. Next to this, we found of importance an early action of the intestine. Instead of constipating our patients

for five or seven days, by filling them full of opium immediately after the operation, the rule was observed to produce an evacuation on the third or, at the latest, the fourth day after the operation. This was done by administering a dose of salts early in the morning; an hour after that, an enema consisting of four ounces of sweet oil was given, to be followed in about half an hour by a large injection of soapsuds, which generally resulted in a painless and easy evacuation. After the stool the anus was washed and a narrow strip of iodoform gauze was slipped into the breach.

As to the final result, these have to be noted: To avoid the occurrence of stricture, subsequent to the use of the clamp and cautery, the former should be applied so as to stand radially to the anal aperture, and it is of importance not to embrace in the clamp more than the uppermost third of each hæmorrhoidal node. Finally, to avoid hæmorrhage, it is important to use moderate, that is, a dull, cherry-red, heat, which will effectually shut off all vessels. If the cautery is too hot the nodes are burnt off too quickly, and the eschar is not deep enough. Hence, when the clamp is taken off, and the slender thrombi are disturbed, arterial hæmorrhage is apt to set in, and will require individual ligature of the bleeding vessels. Another safeguard against hæmorrhage is the *tampon tube*, a piece of stout rubber tubing, four inches in length, wound about with a piece of iodoform gauze, well greased and then slipped into the anus, its proximal end reaching beyond the sphincter. While permitting the escape of flatus, this obturator will control oozing better than anything else, besides serving readily in the administration of the first enemata. Of course, this tube has to be plugged up after the first oil and soapwater enemata. As to the use of opiates, the general rule was this, to give the patient a small hypodermic injection of morphine for the first night, and none afterward. Of course, this rule suffered occasional exceptions, but in general was well observed. It was gratifying to see how rapidly the patients recovered their appetite, and how soon, generally on the sixth day, they were able to leave the bed. Care was taken to cause a daily stool by enema, and this, together with the

absence of the effects of opium, had a most excellent influence upon the physique and morale of our otherwise abnormally sensitive patients. The average duration of the after-treatment was three weeks.

Next in frequency were the operations by *ligature*, which was employed in sixty-three cases. Though not very pleasant to the patient, I consider the ligature of hæmorrhoids a very safe and very convenient method of treatment in the hands of the general practitioner. No special instrumentarium is needed, the pocket case furnishing all the requisites, and the procedure is, judging from our experience, also an entirely safe one. Only in one instance did a serious complication occur, when hæmorrhage set in on the second day, apparently from slipping of an unsafely applied ligature. Considerable blood was lost before the facts were ascertained, and the patient became very anæmic and restless after the expulsion of large quantities of liquid and clotted blood from the rectum. An anæsthetic had to be given to insure tolerance, when, under the guidance of a speculum, the bleeding artery was easily found and deligated. The patient made a somewhat delayed but perfectly good recovery. Another drawback of the ligature is the prolonged and severe pain felt by most patients, necessitating the steady use of opiates until the ligatures are cast off. Finally, it was noted that patients whose hæmorrhoids were ligatured almost invariably required the use of the catheter, which had to be used much longer than after the other operations. The ultimate results and the duration of the treatment were not different from those observed after the use of the clamp and cautery.

Whitehead's or Lange's operation was generally reserved for the more aggravated cases characterized by prolapse of the anal or rectal mucous membrane. A few years ago a hot and somewhat intemperate controversy took place in one of our medical journals regarding the merits of this method. A rising light on the field of rectal specialism condemned the operation off-hand, basing the condemnation upon a purely theoretical basis, not having at that time ever done this operation himself. To gain a personal knowledge of the facts bearing upon the

question I commenced to perform the operation on selected cases, and have even permitted my house surgeons to do it, so as to test the method in more and less skilled hands. In addition to the forty-seven cases operated at Mount Sinai Hospital, my personal experience, gained in the German Hospital and in private practice, embraces twenty-four other cases, that is, a total of seventy-one, an adequate number to justify a competent judgment of its merits and disadvantages.

First of all, the operation is perfectly rational and well conceived. Properly performed, it is not as rapid as that by ligature or the clamp and cautery, but it is neither very bloody nor technically difficult. Its results, if the essential points of the easy technique are faithfully adhered to, are more brilliant and rapid than those of any other known method. It is not fair to charge ill results due to imperfectly done operations to the method. As in Lange's and Whitehead's, so has this operation in my hands yielded invariably good results. Among the cases operated on by the less experienced men belonging to the house staff, two forms of failure were to be noted. First, the failure to get complete primary union, leading to the establishment of a semicircular or *circular cicatricial stricture*; and, secondly, *ectopy of the anal mucous membrane*, caused by the unnecessary removal of circumanal integument. Profuse hæmorrhage during the operation, as well as the two other shortcomings, are not inherent to the operation itself, but are purely the result of improper and unsurgical management. I shall not weary you by a description of the steps of the operation, and let it be sufficient to say that the average duration of the operation was thirty minutes, that very little pain was experienced by the patients, and that their bowels were generally moved about sixty hours after the operation in the manner described above.

Very great pains were taken in the preparation of the bowel before the operation by thorough purgation and daily enemata for at least three days. On the morning of the operation, after a large enema had cleansed the gut, an opium suppository was slipped in. To prevent soiling of the field by fæces during the operation, a large sponge, secured by a string, is



pushed high up into the rectal pouch, after which step the mucous membrane and skin of the breach are thoroughly cleansed with a sponge held by forceps, soft soap and water, and finally a sublimate irrigation. During the operation strict cleanliness must be observed to insure primary union. Three times in forty-seven cases we failed to get primary union. Either the stitches were put in with too much tension and cut through prematurely, or the wound being infected suppuration set in. In every one of these cases a circular cicatrix appeared, and was tending to the formation of stricture. In each case excision of the cicatrix and suture remedied the trouble. In one case where too much of the outer integument had been removed, we had to deal with a condition more difficult to remedy. A not inconsiderable ectopy or eversion of the anal mucous membrane took place in this case, and gave rise to ulceration and hæmorrhage. I suggested a plastic procedure, but the patient was unwilling to undergo another operation, which would confine her to bed for two weeks. Hence, I have contented myself by superficially searing the anal margin with the actual cautery, and doing this repeatedly until the mucous membrane became toughened and dry, somewhat resembling outer skin.

Altogether, we may say that the operation is indicated in cases of extensive protrusion of the anal mucous membrane, that it gives excellent results if performed properly by a person who has had a good surgical training, and who has seen the operation done properly. To an infrequent operator in general practice, who would have to operate with inadequate assistance, the operation cannot be recommended.

#### ISCHIO-RECTAL FISTULA IN ANO, AND ABSCESS.

Of well-established cases of fistula in ano were operated 118. As regards their importance, it can be said that in extent and variety a great diversity was observed, hence the length of time needed for the cure also varied from between five days to sixty-five days, the average being eighteen days. In very extensive wounds, caused by the division of the bridge, especially where the topographical relations of the wound were simple, a very

considerable shortening of the time required for healing was accomplished by a careful excision of the pyogenic membrane of the fistula and immediate catgut suture of the wound in tiers. In twelve cases excision and suture were employed with very gratifying success. In each one of these six or eight weeks would have been required to bring about closure of the wound by granulation. The suture permitted us to heal these extensive wounds in most of the cases in two, three, in the worst ones in four weeks. All the patients were cured.

Among the forty-nine cases of ischio-rectal abscess there were some dreadful forms of destructive phlegmon of the ischio-rectal connective tissue. A considerable proportion—over one-third—occurred in diabetic subjects, and in some of the cases the process involved scrotum, perineum and the space beyond the pelvic fascia. Three of the worst and most neglected cases died: one of exhaustion, shortly after all the recesses and sinuses had been laid open by the knife; a second one of metastatic gangrene of the lung; the third patient of a gangrene of the entire scrotum and perineum. In all of the cases the tendency to the spread of the destructive process was very marked, and, I believe, was considerably accentuated by the fact that previous to the admission of the patients to the hospital the trouble had been fomented and encouraged by the prolonged use of poultices. The therapy employed was always a very energetic and comprehensive one, consisting in converting the irregular burrows into a simple and shallow, often very extensive, wound. It was gratifying to see the immediate improvement in the condition of the patients, and most notable was the circumstance that where, during the progress of an active suppuration considerable quantities of sugar (up to 10 per cent.) had been observed in the urine, this proportion of sugar was either very much diminished, or, in some cases, entirely disappeared after every thoroughgoing operation. I hardly need to say that in many of the cases belonging to this class months were required to fill up the extensive gaps caused by sloughing and subsequent incisions, the longest period of treatment noted being 124 days. In one case a secondary plastic by suture notably shortened the time of treatment.

## ULCERS OF RECTUM, AND FISSURE IN ANO.

Six times chronic ulcers of the rectum came under treatment. In three instances the affection was the result of operations performed months, or even more than a year, previous for hæmorrhoids, by practitioners not connected with the hospital; once the operation was by ligature, twice by the clamp and cautery. In every one of these cases the presence of the elevated, smoothly-granulating ulcer was the cause of a remarkable train of nervous symptoms involving the urinary organs. One of the patients, a very busy physician, suffered from excruciating pain at defecation, radiating to the thighs and the penis, and frequent and painful micturition. He had become a habitual morphinist, and had submitted to repeated operations, consisting of stretching the sphincter and the application of chemical caustics and the actual cautery to the ulcer, which was situated anteriorly just above the proximal margin of the sphincter and corresponding to the prostate. The size of the smooth and pale ulcer was that of a three cent piece. On excision it was found that the base of the indolent ulcer consisted of a thick cicatricial mass extending through the entire thickness of the gut. This mass was excised and the resulting rather extensive wound was united by three tiers of buried catgut sutures. From the moment of the excision all the reflex pains disappeared, and the patient ceased to use morphine. In every one of the other cases excision and suture were employed with satisfactory results.

Fissure in ano complicating hæmorrhoids was observed in eighteen cases. Four times it occurred without any complication. The treatment consisted mostly in stretching the sphincter and a shallow incision of the superficial fibres of this muscle. In three cases, however, where much cicatricial matter had been deposited about the fissure, the entire mass was excised, and once, where this excision extended to a considerable depth, the buried catgut suture was resorted to.

## CICATRICIAL STRICTURES OF RECTUM.

Extensive and mostly intractable ulcerative proctitis was observed six times, the patient being in each case a woman. As

to the previous history, syphilis was indubitably present only in one case. Twice, however, a history of suppuration of the Bartholinian gland could be assumed. In four cases linear proctotomy, followed by gradual dilatation, brought about a moderate alleviation of the disorder. Twice where the limits of the multiple strictures and ulcers could not be reached by the finger tips, and where manipulations in the organ usually led to febrile seizures and much local pain, inguinal colotomy was successfully done and brought great relief to the embarrassed defecation. Subsequently, in one of these cases, excision of the diseased section of the rectum was practiced, with fatal termination due to collapse from acute anæmia. This case will be referred to later in speaking of colotomy and excision of rectum for cancer.

#### PROLAPSE OF ANUS.

Protrusion of the anal and rectal mucous membrane was treated in eleven cases, mostly of children of tender age. In these the linear application of the actual cautery, producing from four to eight longitudinal scars, which passed through the entire thickness of the rectal and anal wall, was generally followed by a cure. Once in the case of a lad, thirteen years old, repeated applications of the thermo-cautery were found unavailing. Here we had to deal with a very lax sphincter and a prolapse of the mucous lining of the breach which measured three inches. Two lozenge-shaped segments of mucous membrane and skin, five inches long and an inch wide, the widest parts corresponding to the anal margin, were excised, one anteriorly, the other posteriorly. Then the edges were united by a number of tiers of buried catgut sutures in the longitudinal direction. Defecation was brought about under the usual precautions on the third day, and the wounds healed throughout by first intention. The final result was very satisfactory.

#### ATRESIA RECTI AND ANI.

A new-born male child was admitted with enormous distention and vomiting, due to atresia recti. Colotomy was performed by Dr. Wyeth, when it was ascertained that the rectum

was absent, the descending colon terminating in a blind pouch. The patient died of exhaustion shortly after the operation. In another case of a male child anal atresia was successfully relieved by incision and subsequent proctoplasty. In a third case where, in a girl, anal atresia was combined with congenital recto-vaginal fistula, defecation being done through the vagina, the perineum was split open, dividing the bridge of tissue between the anus and the vagina. Then the rectal and vaginal cylinders, together with the perineum, were restored as in a laceration of the perineum.

#### POLYPUS OF RECTUM.

Rectal polypus was treated in seven cases, mostly children, by ligature and ablation. The eighth, a most remarkable case of *multiple adenoma of the rectum*, deserves special mention. The patient, a poorly-nourished anæmic boy of eighteen, stated on admission that he had been suffering from pain and protrusion of a tumor on defecation since about twelve years, the trouble becoming worse continually. Examination under anæsthesia showed that the rectal pouch was literally crowded full of soft, easily bleeding pedunculated masses, the upper limit of which could not be reached by the finger. The sphincter being lax, it was very easy to evert the lowermost part of the rectum, when the protruding masses appeared to be as large as a large fist. They consisted of innumerable single and lobulated tumors, which were attached by pedicles of varying thickness to the rectal wall, and so close to each other that it was difficult to find even a small patch of normal mucous surface. All of these masses which could be conveniently reached by the aid of two Sims vaginal specula were either burnt off at their base with the thermo-cautery, or where their pedicles were rather massive were first tied off and then removed. A careful microscopical examination of the neoplasms showed them to be true adenomata. The patient's wretched condition forbade a further extension of the measures directed against the neoplasms on that occasion. Under forced feeding matters improved so much that four weeks after the first operation a second, more extensive, attempt was

deemed expedient. The coccyx and lower half of the sacrum being exposed by a median incision, the former and the lower segment of the latter up to the third sacral foramen were removed. The rectum was then laid open by an incision extending just from above the sphincter to the stump of the sacrum, whereupon the organ became very accessible by means of broad retractors. The adenomata, located well up in the sacral excavation, were then removed either by ligature, or those that were attached by a broad base by the actual cautery. As a relapse was probable, the wound was left open to permit of a continuous supervision of the site of the disease, or eventually of a repetition of the treatment. This observation was carried on for two months subsequently, and a number of adenomatous nodules were again and again destroyed. Should the tendency to relapse not diminish, an extirpation of the diseased part of the gut will have to be considered, otherwise the gut will be closed by a longitudinal suture.<sup>1</sup>

#### CARCINOMA OF RECTUM.

In seventeen cases rectal cancer was observed, and the diagnosis was in each case confirmed by microscopical examination. Five times the patients declined to submit to operative treatment of any kind, three times in the absence of stenosis, and on account of far-gone emaciation and cachexia no operative measures were thought to be advisable. In the remaining nine cases inguinal colotomy was done five times with one death. Kraske's excision of the rectum was performed three times with one death, and once the old-fashioned perineal extirpation was successfully resorted to. As previously mentioned, inguinal colotomy was done twice, and Kraske's method of extirpation of the rectum was performed once for ulcerative proctitis. The extirpation, which was exceedingly difficult and bloody, resulted in the patient's death from acute anæmia; the colotomies were successful.

In considering these methods we have at our disposal seven colotomies and five extirpations of the rectum. The

<sup>1</sup> Plastic closure of the longitudinal incision was done July 12, 1893.



experience gathered from this material may be summarized in these remarks: Cicatricial or neoplastic stenosis of the rectum was always considered an ample indication for the performance of colotomy, which was successful and afforded great relief in six cases. Though it was mostly found to be a comparatively easy operation, twice a serious difficulty was met with in the shape of a short or retracted mesocolon. In one case, that of a very fat old man, suffering from far-gone and high-reaching cancer, the mesentery of the sigmoid flexure was a hard, unyielding and shrunken mass of cancerous tissue. The gut was so closely attached to the pelvis that its fixation to the abdominal wall was a matter of much labor and great difficulty. The patient was suffering from a chronic bronchial catarrh, with a tenacious secretion, and had contracted the bad habit of hawking and coughing in a violent manner to clear his windpipe. Silk sutures were used, and the gut was incised on the third day after the operation, and the mucous membrane was then stitched to the skin with an additional row of sutures. On the fifth day, when success seemed assured, the distal row of sutures gave way during a fit of coughing, and small intestine prolapsed, and became soiled with feces. The patient did not notice the accident, and it was noticed only when after another access of coughing a coil of gut slipped out from under the dressings. It could not be ascertained for how long this state of affairs had existed, but the mischief proved to be irreparable. About three feet of intestine were found thoroughly smeared over with semi-liquid feces, and intensely congested. Though they were carefully cleansed and easily replaced, an intense septic peritonitis developed within a few hours and carried away the patient.

In the other case colotomy had to be done for ulcerative cicatricial stenosis in a young woman. The mesentery was found short and rigid as high up as the splenic flexure, and rather than make another incision I determined to attach the colon at the usual place as well as could be done. Here, as in the former case, the formation of a spur was out of question, but, the patient being very lean and emaciated, fixation of the gut was finally accomplished. The absence of a spur was found to be a great

drawback, as considerable quantities of feces escaped into the distal part of the rectum to regurgitate or to cause much suffering during their passage through the strictured and ulcerated bowel. Later in this case extirpation of the rectum was performed at the urgent request of the patient, and the shortness and rigidity of the mesorectum was found to be a formidable obstacle to the safe performance of the operation.

*Prolapse of the intestinal mucous membrane*, or rather eversion of a section of the gut, was observed once, in a case of ulcerative and strictured rectum. With a view to a future extirpation of the diseased part of the organ, colotomy was done rather high up, and in a portion of the colon having a long mesentery. In this case the colon was surrounded by an unusually massive deposit of fat, and fixation of the gut was rendered somewhat difficult because the determination of the proximal and distal portion of the colon could not be satisfactorily made. Hence it happened that the loop of intestine selected for fixation was attached with a twist, and defecation requiring more than the normal amount of intra-abdominal pressure, together with the causes mentioned before, led to a considerable prolapse. But as it was intended to close the artificial anus after the extirpation of the rectum, this inconvenience will be remedied.

Under ordinary circumstances, colotomy was done as follows: Whenever possible, the patient's bowel was prepared by a thorough purgation, then the longitudinal incision was made two inches to the inward of the left anterior superior spine, beginning two inches above Poupart's ligament. After division of the peritonæum this was attached to the skin by a few silk sutures. Then the colon was sought for and withdrawn. Whenever extirpation was considered probable, the most proximal part of the colon was attached to the abdominal wall that could be drawn to and comfortably fixed in the wound. The tension produced by this mode of fixation would also prevent prolapse. To ascertain whether the coil of gut selected is parallel with the axis of the colon or is twisted, Czerny's expedient was found very useful. If the coil is as it should be, the finger, if passed down to the posterior

pelvic wall, along the gut and its mesentery on the outside, should remain on the lateral or outer side of the mesentery; that is, the mesentery should be felt as a screen extending upward and downward and preventing the passage of the finger-tip to the inner or medial side of the gut and mesentery. If the gut is twisted the finger, slipped down from the lateral or outer side of the gut, will find its way to the inner or medial side of the mesentery. The colon is now withdrawn sufficiently to bring the mesentery of the middle of the coil to the surface, a long, well-disinfected shawl pin is passed through skin, peritonæum on one side, then through the mesentery behind the gut, then through peritonæum and skin on the other side. Finally a single circular continuous suture is run around the incision, uniting parietal peritonæum to the gut if the intestine is not to be incised immediately. Should this be deemed necessary, two superimposed peritoneal sutures will give better security against fecal infection. To prevent traction or compression of the attached coil of gut by the dressings, we have been in the habit of placing over the wound a semi-globular tea-strainer, which permitted the escape of all secretions and prevented the adhesion of the dressings to the intestine. Forty-eight hours after the operation, and after the withdrawal of the pin, the gut was opened by a transverse incision reaching nearly down to the mesentery. In the fatal case mentioned before, the use of a shawl-pin was impossible, and in a similar case it would be proper to close the first incision and to perform colotomy on the right side.

It was claimed that colotomy had the tendency to check the growth of rectal cancer, or lead to a cure of ulcerative proctitis. In none of the cases referred to here could such a thing be observed; the cancers continued to extend, and ulcerations did not yield to local treatment more readily than before operation. But, on the other hand, it cannot be denied that because the feces were diverted from the diseased parts, not only did the patients suffer much less pain, but infection was better combated by irrigations from below, and, there being less retention, the septic and febrile elements of the malady were lessened, and the operation generally resulted in an improvement of the patient's general condition.

Extirpation of rectum was performed by myself in five cases, four times for carcinoma and once for strictures caused by ulcerative proctitis. Of these five patients two died in consequence of the operation, both of acute anæmia; one suffering from carcinoma, the other from ulcerative proctitis. In both Kraske's operation was done. The first of these fatal cases concerned a very flabby, fat and anæmic person, aged forty-nine, with a high-seated circular cancer extending further than the finger could reach. The operation was very easy, and consumed only thirty minutes. The hæmorrhage was moderate, but proved to be fatal, as the woman's pulse, which had become thready and rapid toward the end of the operation, never recovered in spite of energetic stimulation. She died twelve hours after the completion of the excision.

The second fatal case was the one of a young married woman of thirty, on whom colotomy had been done several months previous to extirpation for very extensive and high-reaching ulcerative and stricturing proctitis. As mentioned before, serious difficulty was encountered in this colotomy from shortness of the mesocolon. The patient was not content with the marked improvement of her condition following colotomy, and urgently requested an extirpation, so as to get rid of her artificial anus. Though her general nutrition was vastly better than before colotomy, I earnestly dissuaded her from this serious step, fearing that she lacked strength enough to withstand the shock of extirpation, which, judging from the shrunken and brittle mesocolon found during colotomy, would in all probability turn out a very difficult and tedious process. Finally, I yielded to her entreaties, and having plainly warned her of the great risk taken, determined to excise the morbid part of the gut. The operation was very difficult, bloody and tedious. The rectum was very brittle, tearing whenever it was firmly grasped by hand or instrument, and its attachments to the sacral excavation, and, higher up, to the posterior aspect of the pelvic cavity, were very dense and vascular. The vessels, being imbedded in unyielding inflammatory material, did not retract, and their securing by clamps and ligature also met with much difficulty

on account of the brittleness of the tissues. Six inches of the gut were removed, and the stump was attached to the edge of the sacral section. Profound collapse set in immediately after ablation of the rectum, the peritoneal wound was hastily packed with iodoform gauze, and the patient having been brought to bed, forty-five minutes after the beginning of the operation, was subjected to all known forms of stimulation, including three saline infusions into her median vein. These were each time followed by an evanescent improvement of the pulse, but consciousness never returned, and the patient died twenty-four hours after she had been brought to bed. Toward the end the temperature, which had been subnormal for sixteen hours, began to rise, and just before death reached  $104^{\circ}$  F., indicating that infection of the wound had probably taken place.

The other two cases of Kraske's operation were successful. In both about six inches of the gut were removed. The patients' general condition being good, they easily overcame the entailing shock. The peritoneal wound was immediately closed by catgut sutures, and the recesses of the formidable wound having been tightly packed with strips of iodoform gauze, the rectal stump was attached to the sacral angle of the external wound by a few stout sutures. None of the operations took more than one hour's time, and the hæmostasis and management of the other details of the procedure were rendered remarkably easy where the tissues were found to be normal. The packings were removed on the fourth day after an evacuation of the bowel by a high enema. In the first of these cases, presented to the Academy of Medicine of New York about four years ago, a marked hernial tendency was noticeable in the scar for about a year after the operation, whenever the intra-abdominal pressure was increased in coughing or during defecation. This tendency, however, disappeared, and the patient was perfectly well for four years. A few weeks ago he presented himself with a local relapse, and though his general state was still very good, I declined to interfere on account of a suspicious infiltration, extending far up the prostate and neck of the bladder. Had merely colotomy been done in this case, the patient would have presumably died two or three years ago

The second successful case was that of a middle-aged, ruddy physician, hailing from the northwest. Here, also, about six inches of the rectum were excised twenty-two months ago, according to Kraske. The operation, though very bloody, was comparatively easy, and was excellently borne, and the patient was discharged cured eight weeks after it. As a portion of the sphincter was saved, a secondary plastic operation was done in October, 1891. But the nervous supply of the sphincter having been cut, this measure did not markedly improve the patient's control of the bowel. Still it is to be said that in these, as well as in other cases of rectal excision in which the sphincter had to be sacrificed, the fibres of the retracted levator ani were uniformly found to form a sort of third sphincter, offering sufficient resistance to a solid fecal column to retain it, or at least give the patient sufficient warning and time to enable him to reach a place of easement. In this case no signs of relapse are visible at the present time, and the patient's physical and mental condition is in every way far preferable to the state of despairing resignation which we observe in those on whom colotomy alone was performed.

In the case of a woman fifty years old, whose very wide pelvic aperture permitted easy access without extirpation of the sacrum, the coccyx alone being excised, four and a half inches of the rectum were removed according to the old-fashioned perineal method. She made an easy and rapid recovery, but as only five months have elapsed since the operation, no conclusion as to its lasting value can be expressed.

As to the preference of the radical operation to colotomy, where the patient's general condition permits it, there can be no serious discussion. But the cases must be carefully selected, and the determining factor should be sought rather in the general powers of resistance of the patient than in the extent of the local disease. I may be permitted to mention here that one of my patients, from whom I removed, at Mount Sinai Hospital, six inches of cancerous rectum nine years ago, and who had a relapse three months afterward, for which a second time additional two inches of the gut was removed, is perfectly well to



this day. The sphincter was saved here, and at the second operation the rectal stump was brought down to the original site of the anus, and attached there. This patient now exhibits a very effective degree of sphincteric control.

Regarding the mode of performance of extirpation of the rectum, a few remarks may not be amiss :

*First.*—Select only cases that, though showing other signs of illness, still possess a very good circulation ; in short, whose heart and blood supply are fairly preserved. Do not omit to prepare the patient by preliminary colotomy where much fecal distress and more or less fever are due to stricture and ulceration, and pay scrupulous attention to your patient's preparatory feeding and general régime.

*Second.*—During the operation husband your patient's blood by careful hæmostasis. Not one drop of blood should be unnecessarily lost. Much of it must be shed unavoidably. Mass ligatures, single ligatures, temporary clamping, packing and finger pressure, in short, all the expedients practiced by the modern surgeon for saving blood in abdominal operations, should be scrupulously employed, and to their widest extent.

*Third.*—The most painstaking asepsis is an essential condition of success. A serious source of infection is the rectal tube itself. To avoid contamination from this source, the lower end of the diseased rectal segment should be tied off at once, as soon as enough of it has been dissected out to permit of the application of a ligature. In developing the organ from the pelvic cavity, as little force should be used as possible, as septic rectal contents may find easy egress through accidental rents long before they are discovered. The surgeon should never go too near the muscularis of the gut, and should keep outside of the circum-rectal envelope of fat. Should the gut be accidentally torn or incised, the breach, however small, should immediately be closed by tight suture. As long as the integrity of the gut is not broken irrigation will be unnecessary. But where the gut is accidentally opened, copious irrigation will become indispensable.

Both hæmostasis and asepsis will be materially assisted by

the employment of the posture recommended by Lange, of New York, which resembles Bozeman's, inasmuch as the prone patient's breach is well elevated by a proper support, consisting of one or more hard cushions. I have found that raising the breach end of the table, its legs resting on two wooden chairs, answers the purpose very admirably.

The after-treatment of the wound should be according to the open plan, by light packing, renewed every third or fourth day. A short hot sitz bath, preceding the change of dressings, will be very grateful to the patient and helpful to the surgeon.

The patients should be made to leave the bed as soon as possible, and generally long before the wound is healed. It sounds paradoxical, but it is true, that they are sooner able to walk than to sit up with comfort. If tired, they should be ordered to lie down and rest, but the sooner and the more they manage to walk about, the more rapid will be their general recovery.

## ELECTROLYSIS IN THE TREATMENT OF FIBROUS ANCHYLOSIS.

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IF one may judge by the small amount of literature presented, electricity seems still to be employed in surgery only by the gynæcologist as a means of reducing fibroid tumors, fibrous adhesions, and other conditions in this special branch, and by surgeons for diagnostic and cautery work, for traumatic paralyses, and, perhaps, by a few in the treatment of strictures of the urethra and rectum and some other conditions; but none seem to have made use of it, except incidentally, in the treatment of restriction of motion in joints, tendons and muscles, due to the development of new-formed fibrous tissue following traumatism, whether accidental or operative, and disease.

In "An American Text-Book of Surgery" (page 404) the author says: "By massage, by frictions, by baths, by regulated movements, by the use of electricity, especially by massage and movements, much may be accomplished in the removal of peri-articular exudations and adhesions. But in the majority of cases a fibrous ankylosis will require for its removal either a forcible rapid breaking up of the adhesions and straightening of the limb or a slowly-effected correction of the deformity by continuous or intermittent traction, by weight-extension, or by apparatus. As a rule, the former method is to be preferred. . . . The operation is usually free from danger, and followed by little or no local or constitutional disturbance. But accidents, and serious ones, may occur. . . . No one of these accidents is to be expected; any one of them may happen. Because of the setting free of

the infecting organisms . . . forcible breaking up of ankylosis following either septic or tubercular disease should not be done. By the employment of weight-extension, or by an apparatus permitting of a gradual widening of the abnormal angle, the deformity can usually be corrected after a time." In another paragraph: "Both at the elbow and at the knee (after fracture of the patella) a resulting fibrous ankylosis, if forcibly broken up, will commonly be quickly reproduced, but with active use of the joint will generally spontaneously disappear in the course of a few months, or, at most, in a year or two."

I have quoted at some length because, this being our latest text-book and by eminent authors, it may be considered a standard of what we think and teach at the present day, and I find by comparison that it agrees substantially with the latest German works. If, then, the above is accepted as a standard of our treatment, it certainly leaves us very far from the ideal, and it is simply allowing nature to effect a cure with very little help from us.

As for the forcible breaking up of adhesions, we have all had the experience of the author, and while in a few cases we succeed, in a majority the result is, as the author says, a prompt return of the condition.

Massage, passive motion and baths are no doubt of great help, but they are only adjuncts to time and the continual use of the part.

Electricity is barely mentioned, and when it is employed is usually ordered as one would order a tonic or cathartic, the particular kind and quantity being left largely to the selection of the patient, nurse, or doctor.

The fact is established by numerous authorities that electricity is capable of dissolving new-formed fibrous tissue, but its use in the treatment of fibrous ankylosis seems never to have been systematically followed, or, at least, the results, so far as I know, have not been published. This may be for several reasons, of which the principal ones might be the amount of time necessary to its proper administration, and the annoyance the possession of the average battery causes by its general unsatis-

factoriness and unreliability. The first objection is not so great as it would appear, for the results are so quickly obtained that it becomes more a question of whether one gives the patient so many hours of time, divided into periods of half an hour for electricity, or shorter periods for manipulation, application and examination of apparatus, etc.; thus the question of time will be found in favor of electricity. The second assumed objection, I think, has been overcome, and I will consider it later.

It would be impossible for me in the time at my disposal to give even a faint outline of the known truths of electrolysis. That electricity has a dissolving action on newly-formed fibrous tissue is generally conceded, and any one doubting this should be convinced by referring to the literature of the past ten years. This electrolytic action is obtained with the galvanic current, either continuous, or what Dr. Piffard calls a fluctuating current. The mode of application briefly is as follows: I use electrodes varying in size according to the part under treatment and the extent of the adhesions; usually one large flat electrode and one ordinary sponge electrode with handle. The large one is easily made of thin sheet copper, and may be bent to any shape. It may be covered with sponge, cotton and sheet lint or other material, or placed without permanent covering in the dish of solution, a flat sponge or some cotton laid upon it and the part to be treated rested upon that, perhaps partly surrounded by the solution. The large electrode should be nearest the adhesions and attached to the negative pole; the small one applied to the opposite side.

Both electrodes should be wet in a salt solution, and of several solutions I have tried best, results have been obtained with a rather strong one of ammonium chloride.

The electrodes applied, the current is then turned on and increased till the patient will stand no more. The amount that can be given depends on the sensibility of the part and the temperament of the patient. If applied to the same part in two healthy individuals the amount borne by each will be found to vary very greatly. Passing a current through my own hand I can bear not more than 10 to 12 milliamperes, while I have

given through the hand of another 50 milliampères with seemingly no greater discomfort.

The amount that a patient will take may be recorded from the milliampère-meter at the first and second applications; and it will be found that the same or increased amounts may be given at future applications, except in some cases. Such a record will also be found useful in preventing any attempt at malingering.

As to the strength of current necessary to dissolve adhesions I can make no statement, except that I have obtained results with a current as low as 8 to 10, and have given as high as 75 milliampères, but have noticed no proportionate increase in the dissolution. I have remarked, however, that the older the adhesions the greater the current necessary to dissolve them, and believe in a strong current for a short time rather than a weak one for a longer time.

The duration of the applications I make from ten to thirty minutes, and repeat them at intervals varying from one to five days.

CASE I.—C. W., female, aged sixty-five years, housekeeper. Admitted to Bellevue Hospital November 21, 1892. Three months before fell from a low platform, striking on her right shoulder; swelling great and lasted four weeks; pain persisted to date of admission; had no professional treatment. Examination, November 21. No swelling, discoloration or deformity except that produced by slight atrophy of shoulder muscles; no tenderness on pressure; all motion at the shoulder is very much restricted. The hand is slightly swollen and bluish, showing poor circulation, and she is unable to use it except for coarsest kind of work. Complaints of continuous and increasing pain about the shoulder, down the arm and slightly in the fore-arm; it is now so great that it interferes with her rest at night.

November 25.—Galvanic current applied; directed through the shoulder.

November 29.—Reports having slept all the night following application, it being the first full night's rest since receipt of injury. Increased motion at shoulder, elbow and in hand.

The galvanic current was applied at intervals of from three to



five days with steady and rapid improvement in motion, and on December 8 the patient returned to her home in New Jersey, but came back for treatment at intervals till December 20.

The pain disappeared after the first application, and at the time she left me all motions at the shoulder were greatly increased, the hand had resumed its normal appearance and she was able to use it to dress and feed herself, and to do her housework with but little inconvenience.

Under date of May 18 Mrs. W. writes me that "There has been no return of the pain. I can raise my hand over my head and can place it back of me within two inches of as high above my waist as the well arm. I can now knit and sew and do all kinds of house work without inconvenience from arm or shoulder. The muscles have developed equal to those of the other arm."

CASE II.—M. C., female, aged forty-four, domestic. Admitted to Bellevue Hospital June 1, 1892. Tubercular (?) disease of right wrist joint, which was greatly swollen, very painful and filled with fluid. Treated vigorously until about July 15, when a plaster splint was applied.

The wrist was examined and the plaster reapplied at intervals until October 15, when it was found that the swelling and fluid had disappeared and pain was very much less. All the joints from the wrist down were ankylosed.

On October 20, under anæsthesia, the adhesions were broken up as much as possible; no motion whatever could be obtained at the metacarpo-phalangeal joints, and but slight motion at the others. This was followed by swelling and a return of the stiffness.

November 10.—The swelling had disappeared; there was very slight motion at the wrist, and none at the other joints. Hand and fingers were glazed, and circulation poor.

The galvanic current applied two and three times a week.

\* December 17.—Thirteenth application. The wrist and fingers quite supple; about 35° motion at the metacarpo-phalangeal joints; the thumb can be carried to opposite the middle finger. The circulation is greatly improved, and she uses her hand actively to dress, eat and at work about the ward. Discharged from hospital at her own request.

CASE III.—J. B., male, age twenty-four, driver. On February 25, 1893, fell from the hub of a wheel to the ground, striking on left elbow. Treated for fracture of the external condyle at Bellevue Hospital.

April 11.—Patient referred to me. Examination showed fracture united; some effusion in, and fibrous thickening about, the joint. Rotation nearly normal; flexion and extension limited to

Angle of extension . . . . .	136°
Angle of flexion . . . . .	101°

Total motion . . . . .	35°
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The galvanic current was applied every two days.

April 18:

Angle of extension . . . . .	145°
Angle of flexion . . . . .	67°

Total motion . . . . .	78°
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Gain, 43° (123 per cent.). Duration of treatment, seven days. The patient insisted on going to work, and appeared on April 30 with the elbow swollen, red and painful, having again fallen on it the night before. He states that the motion continued to increase until he received the second injury, and he had been able to do his work as coal shoveler.

On measurement his statement was verified, for, notwithstanding the swelling, he showed by active motion the following:

Angle of extension . . . . .	118°
Angle of flexion . . . . .	55°

Total motion . . . . .	63°
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He was returned to Bellevue Hospital for treatment.

CASE IV.—M. D., female, aged forty-eight, domestic. On February 17, 1893, fell and received a Colles' fracture of the right wrist. Was treated at Bellevue Hospital with splints for four weeks, and carried wrist in sling two weeks longer. Since April 1 has been using it in work about the ward.

April 12.—Examination showed the hand swollen, with limited motion in the fingers; still less in the metacarpo-phalangeal joints. Had practically very little use of hand and wrist.

Flexion and extension at wrist . . . . .	18°
Lateral motion at wrist . . . . .	9°

Galvanic current applied.

April 19.—After fourth application:

Flexion and extension at wrist . . . . .	53°
Lateral motion at wrist . . . . .	25°

Circulation better; hand less swollen, and can use it much more.

April 28.—After seventh application :

Flexion and extension at wrist . . . . . 60°

Lateral motion at wrist . . . . . 32°

Circulation very much improved, and has such good use of her hand that she requested her discharge.

Gain in flexion and extension at wrist . . . . . 42° (233%)

Gain in lateral motion at wrist . . . . . 23° (255%)

Duration of treatment sixteen days.

CASE V.—J. W., male, aged twenty-six, sailor ; had syphilis six years ago ; never injured arm. Three years ago began to have pain in left elbow, which gradually became stiff ; eight months ago had to stop work because of pain and stiffness in the joint. Admitted to Bellevue Hospital December, 1892. Treated with anti-syphilitic remedies with no improvement.

February 13, 1893.—Dr. Woolsey operated and cleared the posterior olecranon fossa of a bony growth. The arm was dressed nearly straight ; the wound closed promptly.

March 27.—The patient was referred to me for electricity. Examination showed rotation very good :

Extension at elbow to . . . . . 125°

Flexion at elbow to . . . . . 115°

Total motion . . . . . 10°

Galvanic current was applied.

April 7.—Applications were made at first every day ; then every other day to date. Examination shows :

Extension to . . . . . 135°

Flexion to . . . . . 90°

Total motion . . . . . 45°

Gain 35° (350 per cent.). Duration of treatment ten days. Requested his discharge to resume work.

CASE VI.—W. T., male, aged nineteen, stableman, received an injury four years ago by being caught in machinery. The bones of the right forearm were found broken, and treated. The elbow received no treatment, and on recovery was ankylosed at a right angle ; pronation and supination were also absent.

March 18.—Dr. Woolsey operated, removing a bony union between the radius and ulna. The arm was put in plaster for two weeks, then dressed ordinarily.

May 15.—Pronation and supination very good:

Active extension at elbow to . . . . .	143°
Active flexion at elbow to . . . . .	128°
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Total active flexion and extension . . . . .	15°
Passive extension to . . . . .	144°
Passive flexion to . . . . .	119°
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Total passive flexion and extension . . . . .	25°

May 7.—Second application. Active and passive motion the same:

Extension to . . . . .	148°
Flexion to . . . . .	110°
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Total flexion and extension . . . . .	38°

May 13.—Fifth application:

Extension to . . . . .	156°
Flexion to . . . . .	94°
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Total flexion and extension . . . . .	62°

General circulation of extremity much improved.

Gain in flexion and extension 47° (313 per cent.) after five applications. Duration of treatment eight days.

Requested his discharge to go to work.

If the results in the foregoing cases be considered, it will be found that in

Case I the pain, which had persisted for three months, was relieved immediately; circulation in the hand restored; motion at the shoulder and general usefulness of upper extremity greatly increased. Duration of treatment twenty-five days.

Case II. The circulation improved; motion and usefulness of hand and wrist greatly increased. Duration of treatment thirty-seven days.

Case III. Gain in flexion and extension at elbow 42° (123 per cent.). Duration of treatment seven days.

Case IV. Circulation very much improved; motion and usefulness of fingers increased; gain of flexion and extension at wrist 42° (233 per cent.), in lateral motion 23° (255 per cent.) Duration of treatment sixteen days.

CASE V. Gain in flexion and extension at elbow  $35^{\circ}$  (350 per cent.). Duration of treatment ten days.

CASE VI. Circulation much improved; gain in flexion and extension at elbow  $47^{\circ}$  (313 per cent.) after five applications. Duration of treatment eight days.

Immediately after an application, using only a slight amount of force, the thinned and weakened adhesions could be felt to break. (I would here state that beyond this slight manipulation no passive motion was used in these cases.) It is also remarkable that there was an immediate and great increase of motion, in some cases it being doubled. With subsequent applications the increase became less and less pronounced, but in all cases there was a gain after each.

Judging from Cases II and III (the only ones I have been able to trace), I think it may be fairly assumed that any results obtained under this treatment can be considered permanent. This, with the rapidity of improvement, makes it, in my opinion, the most desirable and satisfactory of any treatment known to me.

In the cases given the adhesions were all of recent origin so I am not prepared to say from my own observation whether the galvanic current will dissolve old adhesions as readily. I have at present under my care a case of ankylosis of the elbow from injury of eight years' standing which has shown some improvement after three applications.

Regarding the second assumed objection to the use of electricity by surgeons, I think I can assert with confidence it no longer exists. Those who live on streets or avenues through which runs the Edison wires can be supplied with the street current, which may be safely and conveniently used by means of instruments devised by Dr. H. G. Piffard. This current is very serviceable, but not cheap.

Those who, like myself, cannot obtain the Edison current, must have house batteries. I have several, which have only brought me disappointment until I obtained my present one, made by the Edison Manufacturing Company of this city. Their battery is composed of zinc and copper oxide plates in a potash solution, and possesses the following advantages over all others I

have used: The elements are left in the solution continuously, there being only 1 per cent. per month of action except when the circuit is closed. The current is very steady, so that the use of a storage battery is unnecessary for lighting diagnostic lamps; this uniformity continues to the end of the life of the battery. In other wet-cell batteries that I have used the current is very unsteady, and begins to decrease within a few minutes, sometimes going to almost nothing, due to polarization of the elements.

The battery requires no care until exhausted, when all except the jar and frame is renewed, making practically a new battery.

\* The life of the cells is known, and they may be had of different sizes. Their life in one's office will depend on the amount of electricity used, plus a wear and tear of 1 per cent. per month.

I have given my battery four months' hard usage, and recent tests show the same voltage and amperage as when first set up. The cells are nine-tenth volts each, but the internal resistance is so low that the amperage is very much higher in proportion than some other cells of greater voltage; but, of course, a larger number of cells is required than those of one and a half to two volts each. My battery consists of fifty-four cells placed in a closet off my office, and connected with the switch-board by cable. With this I can do any kind of electric work that a physician or surgeon requires. I have at my disposal all the current necessary for galvanic, faradic, cautery, lighting and motor work. The switch-board may be as simple or as elaborate as one pleases; mine is very elaborate, and with it I can get all the variations of the galvanic and faradic currents of which I have knowledge.



TEN CASES OF ANCHYLOSIS OF THE ELBOW  
JOINT, AFTER TREATMENT OF FRACTURE OF  
THE LOWER END OF THE HUMERUS, WITH  
THE FORE-ARM IN THE EXTENDED  
POSITION: FIVE TREATED BY EX-  
SECTION, FOUR TREATED BY  
INFRACTION, AND ONE  
NOT TREATED.

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**I**F I am right in the view I take of the subject, there are certain pretty well-established precepts in regard to the treatment of fractures in the vicinity of and involving the joints. Let me enumerate some of these precepts in the following form:

When a fracture is near a joint it is more difficult to make a correct diagnosis, because the soft parts are apt to be swollen, because the new point of motion cannot be easily found, and because the fragments may be interlocked or impacted.

If a fracture is near a joint it may be difficult, or even impossible, to make a complete reduction of the fragments when they are displaced. This must be so, because the joint fragment is small and short, because the soft parts are swollen, because the fragments may be impacted or interlocked, and because of the reflex spasm of the muscles which span the injured joint.

Even if the fragments can be reduced they may become re-displaced, since it is not easy to apply perfect retentive apparatus, since the irritated muscles may pull upon the joint fragment which gives attachment to them, and since the pressure of the splints may cause ulceration over the bony prominences.

An injured joint is likely to take on inflammation which may lead to adhesion and ankylosis; and among such injuries we note joint-involving fractures, but we are willing to say that some inflamed joints do become stiff.

The elbow joint is not an exception to the principles of these precepts: Here the surgeon might fail to make an exactly correct diagnosis; he might not succeed in making complete reduction of the displaced fragments; he might find that the fragments had got out of place after a few days of treatment; he might, in some instances, find that considerable traumatic arthritis would arise; and he might find that the elbow joint would become stiff, even with all the care he could give his case.

To these precepts and conclusions may be added the two following self-evident propositions:

1. An upper limb, with a stiff elbow joint, having the forearm in the extended position, would be the source of much disability, and the cause of much discomfort.
2. An upper limb, with a stiff elbow joint, having the forearm in the right-angled position, would be very useful to the patient in various ways.

In the next place let us make two statements:

1. After treatment of fracture of the lower end of the humerus, with the forearm in the right-angled position, I have seen cases in which there has been ankylosis of the elbow joint.
2. After treatment of fracture of the lower end of the humerus, with the forearm in a position more or less extended, I have seen cases in which there has been ankylosis of the elbow joint.

Here I wish to put on record the following cases, bearing on the question of position in the treatment of fractures of the lower end of the humerus. The report of these cases contains the treatment to which I resorted for the relief of the disability that appeared to arise from the primary treatment.

CASE I.—I. W. N., a laborer, twenty-nine years of age, the last week in September, 1885, came under my care for ankylosis of the left elbow joint, with the forearm in a position about midway between complete extension and right-angled flexion. The first week

in June, 1885, he had fallen from a height upon his left elbow and suffered from a comminuted fracture of the lower end of the left humerus. The treatment had been conducted by means of a nearly straight anterior splint, which had been kept on during the time he was under the care of his surgeon. When I saw the patient the injured limb was quite useless, and resisted every reasonable attempt to flex the fore-arm on the arm. I advised an operation as the only means by which relief would be likely to be obtained. I made an external incision over the lower end of the humerus and the upper end of the radius, and excised the lower end of the humerus, in order to permit of right-angled flexion of the elbow joint. The condyloid fragments were firmly united in a misshapen mass, and there was bony ankylosis of the elbow joint, which had been for the most part obliterated. The limb was placed upon a right-angled splint, made of wire-cloth. This patient recovered with a somewhat useful limb; the elbow joint recovered about one-half its motion, and the strength was nearly one-half what it was before the accident.

CASE II.—J. L., a schoolboy, eight years of age, in the summer of 1889, while at play in the street fell and broke the lower end of his left humerus into several pieces. The limb was placed upon an obtuse-angled splint, so as to keep the fore-arm about midway between complete extension and right-angled flexion, and in four or five weeks the elbow joint became quite stiff and immovable. This patient was admitted to the College Hospital in September of the same year. It was found impossible to bring the fore-arm up to a right angle with the arm after using very great force; the obstruction was caused by some pieces of bone in front of the elbow joint, where they were located between the lower end of the humerus and the upper end of the radius and the ulna. On the outer side of the elbow joint over the lower end of the humerus and the upper end of the radius I made an incision down to the bone, and then with a sharp narrow chisel I cut out the deformed lower end of the humerus, so that I could flex the fore-arm above a right angle with the arm. This patient was discharged from the hospital on the 7th of January, 1890, with a very useful limb. The flexion of the fore-arm was nearly one-half of what it was originally, and the strength of the limb was such that he could lift quite heavy weights with it.

CASE III.—P. O'H., an errand boy, about ten years of age, in September, 1890, fell on the cobble-stone pavement while he was running along the street, and comminuted the lower end of the right

humerus. The limb was treated upon a nearly straight splint for four or five weeks, and at the end of that time the elbow joint had become quite firmly ankylosed. He was admitted to the College Hospital November 28, 1890. I made every reasonable effort to break up the ankylosis and obtain a useful limb, but I did not succeed. In the presence of the medical class, I cut down on the outside of the elbow joint, and exsected the lower end of the humerus with a narrow sharp chisel, when I placed the limb upon a right-angled splint made of wire-cloth. This patient improved rapidly, and on December 23 was taken home by his parents, who had become impatient with what they thought was unnecessary delay. He was very much improved, and finally had a limb that he could put to good use.

CASE IV.—A young man from the country came to consult me about his left elbow, which had become very stiff, with the fore-arm in nearly an extended position. He had been treated with a straight splint for a fracture of the lower end of the left humerus. The splint had been applied to the front of the limb, and was slightly bent. On September 23, 1891, I made a very determined attempt to bring the fore-arm up to a right angle with the arm, and was obliged to confess my failure. I had this case before the medical class, to whom I explained the nature of such injuries as the patient had sustained. Then I made an exsection of the lower end of the humerus, after the manner above indicated, and put the limb upon a double-angled splint, whose fore-arm piece was made of a piece of pine board, and whose arm-piece was made of wire-cloth. This patient improved quite rapidly, and left the hospital October 7, 1891, going to his home in the country with a very useful limb.

CASE V.—V. H. K., a boy four years of age, as he was at play with some other boys had broken his left elbow in falling from a picket fence, and, as flexing the fore-arm caused him severe pain, the case was treated with a nearly straight anterior splint. He came under my care about six weeks after the accident, when I found that the elbow joint was quite immovable, and that there was a suppurating sinus leading down to dead bone at the seat of fracture. I advised an operation for the purpose of attempting a restoration of the usefulness of the limb. From the external aspect of the elbow joint I exsected the dead bone, which I found to be a detached fragment of the external condyle of the humerus. Then I found a bony fragment firmly interposed between the lower end of the humeral

diaphysis and the upper ends of the bones of the fore-arm ; when this fragment was removed I could easily bring the fore-arm up to a right angle with the arm. The limb was then treated upon a right-angled wire-splint made of wire-cloth, this splint being readily kept clean and being firm enough to support the limb in the proper position. His parents removed him from the hospital sixteen days after the operation—April 24, 1891. This boy did not come under my observation again, but I have no doubt that he obtained a useful limb.

These five cases are important and interesting, and they raise certain points bearing upon surgical practice. Let me state some of them in the order in which they suggest themselves :

1. It was not possible to break up the ankylosed joint in any one of these cases with safety, when it came under my observation, for I made a reasonable and determined effort to bring the fore-arm up to a right angle with the arm, and failed every time.

2. In the dependent position, since the hand could not be brought toward the face and head, the patient could not use it to feed himself, nor could he make it available to any great extent in putting his clothing on and off. In each of these cases I made careful observations to determine the disability, and in every case it was very great.

3. It appeared to me that an operation alone offered any relief from the disability, and in every case the result justified the operation. A proposition of this kind is so self-evident that I only enunciate it.

4. I now ask this question : Would it not have been better surgery to have treated these cases by putting the fore-arm in the right-angled position at the outset, and by letting the ankylosis of the elbow joint take place in that position ? In that way an operation would have been unnecessary. It is of no great moment for the surgeon to say that he could have avoided an ankylosis in such a case. Grant his claim ; but then he cannot treat all the cases that happen, and we must provide for surgeons of ordinary skill.

5. I am ready to say that I have for many years taught

that it is advisable and requisite to treat a fracture of the lower end of the humerus with the fore-arm in the right-angled position. I have done so from the deepest conviction, and I am more and more sure that this practice is best. And when I began to find the facts turning out in that direction, I became somewhat confirmed in the correctness of my views.

6. I am impressed with the purpose of not entering into a criticism of the views of those who differ with me in opinion and practice. But I am sure that the best thing I can do with the above cases is to tell other surgeons about them; in very truth, this is in the line of my duty, a duty which I cannot leave undone.

But I have other cases to report, in which I did not perform any cutting operation; they constitute additional evidence relevant to the issue that has been raised—the issue bearing upon the position of the fore-arm in the treatment of fracture of the lower end of the humerus. In these cases I used *force* to bring the fore-arm into position where it might be made useful to its possessor. Let me briefly give the main points in the clinical history of these cases:

CASE VI.—In April, 1886, a nine-year-old errand boy in one of our dry goods stores was sliding down the bannister and fell upon his left elbow, breaking both condyles. His mother brought him to my office, where I reduced the fragments to place and put his injured limb upon a right-angled splint. He did not return as I directed him, and I did not see him again for eight or ten weeks. Then he came back with his injured elbow firmly ankylosed, the fore-arm being about midway between right-angled flexion and complete extension. He had been under the care of another surgeon, who had removed my splint and then put on an anterior splint which kept the fore-arm midway between complete extension and right-angled flexion. An exsection of the elbow joint was not consented to in this case. It took about eight months to get the fore-arm up to a right angle with the arm, by means of oft-repeated and persistent efforts and the use of great force, and during this period I gave the patient ether four times, in order to facilitate the manipulations.

CASE VII.—A twelve-year-old schoolboy while boxing with his brother fell upon the floor and broke off the external condyle of the right humerus, when the fore-arm became dislocated backward. He was sent to my clinic November 2, 1892, having a perforated



metallic splint on the anterior surface of the limb, with the fore-arm about midway between complete extension and right-angled flexion. I removed this splint and found that the elbow joint was quite immovable and useless. The patient was seated in a chair, and I stood behind his right shoulder, so as to prevent him moving it backward, and then I reached over and took hold of his right fore-arm, and employed great force in order to flex it up to a right angle with the arm, infracting the lower end of the humerus in the process. The fore-arm stopped immovably in this position, and I was obliged to desist in my efforts. Then I put the limb upon a right-angled splint. The doctor who had this case under treatment said that he used a right-angled splint for about four weeks, and then removed it. In about ten days the fore-arm became extended, when he applied the obtuse-angled splint I found on his patient's limb. The forcible flexion of the fore-arm injured the ulnar nerve, causing much pain, but after a few weeks it fortunately recovered. The elbow joint has only very slight motion, yet the limb is very useful.

CASE VIII.—In April, 1884, a man, about forty-nine years of age, came to my clinic having his right elbow ankylosed, with the fore-arm fully extended. He said that he fell five weeks previous and fractured his elbow, and that a homœopath had treated his injury with a straight splint, which had been removed a few days before he came to consult me. The limb was hanging by his side and useless. I began to forcibly flex the fore-arm, when the pain was so great that I gave him ether, in order to complete the operation. Before the fore-arm came up to a right angle with the arm I made a compound fracture of the olecranon, causing profuse hæmorrhage. I then completed the operation, and placed the limb upon a right-angled splint. In two or three days I began passive motion of the elbow joint, and kept it up every three or four days until the time of his leaving the hospital. After several weeks I succeeded in giving this patient a strong and useful limb; the motion of the elbow joint was more than one-half the normal, and the man was able to resume his work.

CASE IX.—In November, 1880, I saw Miss B., eighteen years of age, with her family physician. Her left elbow had been broken, and the fragments of the condyles had been carried backward with the upper end of the fore-arm. An anterior obtuse-angled splint had been applied, so as to keep the fore-arm about midway between complete extension and right-angled flexion. When I saw the patient the resistance to flexion of the fore-arm was very great, the elbow joint being quite immovable. I gave her ether, and finally, after

the use of very great force, got the fore-arm to move upward a short distance. I repeated this attempt at two subsequent times, but could not even then flex the fore-arm up quite to a right angle with the arm. In the meantime the family physician kept up passive motion as well as he could under the circumstances. It appeared to me as if the lower end of the diaphysis of the humerus came against the bones of the fore-arm and prevented their flexion. I could have removed some of the disability by an exsection operation, but the friends of the patient refused to have any operative interference.

CASE X.—A strong laborer, about forty-five years of age, came to my clinic in 1890, after having had a fracture of the lower end of the right humerus treated by means of a nearly straight splint. The fore-arm could be flexed only a little beyond the mid-point between complete extension and right-angled flexion. The flexion of the fore-arm stopped at this point, because there was a considerable piece of bone interposed between the lower end of the humerus and the upper ends of the radius and the ulna. His limb was quite strong, but it was very much disabled, since the fore-arm could not be put into a position where it could be made useful. He most emphatically declined to submit to an operation of any kind, and went away with his much disabled limb.

The clinical histories of these nine cases, five of cutting operation and four of joint infraction, are relevant as evidence in the issue touching the attitude of the fore-arm during the treatment of fracture of the lower end of the humerus; such evidence cannot be excluded from the facts which enable us to come to a decision on this issue. That such cases are possible must be admitted beyond any reasonable doubt. There are two questions involved: (1) How shall we treat such cases when they come under our care? (2) How can we avoid having such cases?

The first question has already been answered by the account we have given of the nine cases above reported. That is, we must resort to forcible joint infraction, or to exsection of the elbow joint. Both of these operations require great skill and much care in their execution, and it is certainly possible that considerable disability may be left after their performance. While we may hope to diminish the disability of the upper limb, in the straight position, with a stiff elbow joint, it is possible that

either of these operations may be followed by some surgical accident. But in any such case the advantages of an operation must not be left out of view. Either infract or exsect the ankylosed elbow joint, and so get the best result possible under the circumstances.

How can we avoid having such cases? In some cases of fracture of the lower end of the humerus we have a movable elbow joint. In other cases, no matter what the treatment, we have a stiff elbow joint. It is frankly and fully admitted that the attitude of the fore-arm during treatment of fracture of the lower end of the humerus, in which there results a movable joint, is not material. But it does make a very considerable difference what the attitude of the fore-arm is in those cases of this fracture in which there results a stiff elbow joint. To say that the displaced fragments of a broken elbow can have better reduction when the fore-arm is extended is a very weak kind of evidence, for that does not prevent ankylosis from taking place. In order to obtain a useful limb it may be permissible for the surgeon to leave his patient's limb with some deformity. But it is not the best surgery to leave your patient's limb greatly disabled by trying to get complete reduction of the displaced fragments.

The best way to avoid having such cases, as I have reported above, would be to treat cases of fracture of the lower end of the humerus with the fore-arm in the right-angled position.

It is proper to add a few other points on this issue by way of suggestion. Every surgeon knows the advantage that comes to a patient with a fracture when he can be up and about, and not confined to his bed. It is not advisable to let a patient go about with his upper limb hanging down by his side when it is encased in splints for keeping bony fragments in place; it is better for such a patient to be in his bed. In the treatment of fractures of the elbow it is my custom to put on a right-angled splint, and apply a sling bandage to the fore-arm, and then let the patient go about and even attend to his business as far as he can, only he is required to use as much care as possible under the circumstances, in order to prevent redisplacement of the bony fragments.

## A CASE OF PANCREATIC CYST.

By J. C. REEVE, JR.,

OF DAYTON, OHIO.

THE patient was a strong farmer of thirty-five years. Four years before operation the earliest trouble began suddenly with what seemed to be an ordinary colic, but it lasted three weeks, during which time he was seriously sick and had fever. After this the tumor was discovered, the size of a teacup, and it was four months before it disappeared. Seven months previous to operation abdominal trouble began again, but this time slowly, with an aching and some vomiting. He was three weeks in the house, ten days of the time with severe abdominal pain. Was constipated then and has been ever since. The tumor reappeared then to remain, but he has been in the intervening period in better health and heavier than usual. So much of the history is supplied by the patient. He seeks treatment on account of the tumor, not of his general feeling, which is quite good. Nothing peculiar about his stools; urine normal.

The tumor, now the size of a small cocoanut, was a little above and to the left of the umbilicus, feeling like a tense cyst, and pulsating plainly from motion transmitted from the aorta. The diagnosis of pancreatic cyst was made two months before.

The incision was from an inch below the umbilicus to four inches above. Omentum was adherent to the cyst and both partially to the parietes, but by drawing the omentum up the cyst was exposed. Bowel was firmly adherent to the upper surface of the cyst, and the latter could not be explored without. It tore under the trocar, and allowed some of the contents, dark grumous fluid, to enter the abdomen. Cavity was very deep, and springing from its bottom was a large fungosity of softened pancreatic tissue, a double handful of which was removed. Considerable hæmorrhage was stopped by irrigation. An inch and a half of the opening, now torn large, was stitched to the parietes, the rest included in the closing sutures. Excepting a mural abscess the convalescence was uneventful; after seven weeks the fistula was very small and discharging little; patient well except slight digestive disturbance.

A few weeks later he was taken with a low form of fever which was prevailing in the neighborhood, and, nearly three months after the operation, died. The autopsy made by a colleague showed a somewhat surprising state of affairs. The left kidney was doubled in size, but otherwise apparently healthy. The right kidney soft and atrophied, pelvis dilated to size of walnut and full of urine, ureter obliterated by old adhesions near tumor. The cyst, the size of a turkey egg, very thin and containing still a small amount of pancreatic tissue; its adhesions to spine and surrounding organs very firm. It would seem as if the pancreatic trouble was secondary to an earlier inflammation near the kidney.

The discharge of pus from the cyst became, a few days before death, bloody and offensive, evidently secondarily so to the fever.

Mr. Jordan Lloyd, of Birmingham, has advanced the opinion that most cases reported as cyst of the pancreas are actually effusions into the lesser peritoneal cavity. This one would seem not to be so because not at all crescentic in form, but round, and because it did not at all extend into the left hypochondrium. The tissue was pronounced by a microscopist degenerated pancreatic tissue.

## EDITORIAL ARTICLES.

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### GLEISS ON NERVE SUTURING.

AN interesting report has just been made by Gleiss on the eleven cases of nerve suturing in Bruns' clinic in Tübingen from 1882 till 1891.<sup>1</sup> The first four of these were primary operations, done on the same day or the day following the injury; the remaining seven were secondary operations. The excellent results obtained in these cases entitle them to a more general publication. In only one did union fail to occur.

Thirteen nerve suturings were done upon eleven patients. The median nerve was sutured five times; once in the upper half of the arm, thrice in the forearm near the wrist joint, and once in the palm. The ulnar nerve was sutured three times; once in the upper part of the arm, once just below the olecranon, and once just below its point of division. The radial nerve was sutured four times in its extreme upper portion. The peroneal nerve was once sutured at the knee.

The technique pursued was after a new method invented by Prof. Bruns. Of course, in the healing of a sutured nerve it is of the greatest importance that no neuritis, the result of septic infection, be set up; and the healing in all of these cases was entirely free from septic reaction.

In the primary suturings no freshening of the nerve ends was necessary. In the cases of secondary suturing, usually the two ends were diagonally freshened, and often the cicatricial tissue between removed. In one such case, in which the divided ends were connected by a cicatricial mass, a longitudinal incision through the middle of the cicatrix and extending on either side well into the

<sup>1</sup> Beiträge zur klin. Chirurg., Band x, Heft 2, 1893.



nerve substance was made; and this converted into a transverse line by sutures passed through the nerve in such a way as to bring the nerve tissue in contact with nerve tissue, as shown in Figs. 1 and 2.



FIG. 1.—Showing longitudinal incision through cicatrix, extending into normal nerve substance on either side.

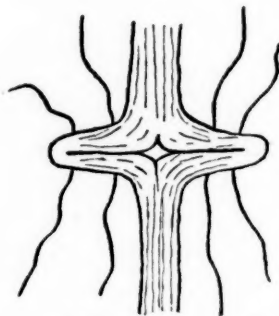


FIG. 2.—Showing incision in Fig. 1 united transversely.

In three other cases the bulbous central end was split up into the normal nerve substance by a single longitudinal incision, and the distal end beveled to a wedge-shape, and sutured into the split

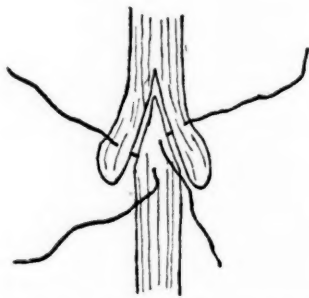


FIG. 3.—Showing nerve stumps united by the wedge method.

central end, as shown in Fig. 3. Two of these cases gave perfect results, but one had to be subjected to a second operation before function was restored.

In another case the divided ends of the ulnar nerve were separated to the extent of 10 cm., so that a direct union was impossible. This difficulty was overcome by splitting off a flap from the proximal segment, and bridging over the space by suturing one end of it to the distal segment. This did not completely effect a cure, though there was some restoration of function.

The method of applying the sutures varied with the circumstances; usually two direct and one or two indirect sutures were employed. No other material than catgut was used. In order to prevent the sutured portion from being compressed by new connective fibrous tissue, in four cases the nerve was protected in a decalcified bone tube which became gradually absorbed.

Restoration of function not having been improved by one of the operations on the median nerve, the seat of suture was cut down upon after eleven months, and a tumor, a neuroma, the size of a bean, was found at the seat of operation. A second operation was done, the nerve enclosed in a bone tube, and a perfect restoration of function resulted. The neuroma did not recur.

In another case the radial nerve had been torn through by a fracture of the humerus, and reunited by suture. At the end of five months there was no restoration of function; the nerve was exposed and found imbedded in cicatricial tissue. It was liberated and enveloped in a graft of skin after the method of Thiersch, to prevent a repetition of this strangulation.

After these operations the limbs were put up in such a position as to bring as little tension as possible upon the nerve. As soon as the wounds were healed massage was carefully initiated, and in conjunction with it electricity was employed and continued as long as possible.

The results in these cases were almost invariably good. Thirteen different nerves were sutured, and all were healed with one exception. This was the case in which there was a separation of 10 cm., and also division of the brachial artery.

Etzold<sup>2</sup> has observed that "in high nerve wounds the prognosis,

<sup>2</sup> Etzold, *Klinische Untersuchungen über Nervennaht*, Dissertation, Dorpat, 1889.

notwithstanding the nerve suture, is unfavorable." He reports six cases of nerve injury in the axilla and extreme upper part of the arm, in which, notwithstanding primary nerve suturing and other treatment, the results were poor. He holds the high position alone responsible, although in all of these cases the axillary or brachial arteries, and usually also the veins, had to be ligated, thereby greatly interfering with the nourishment of the whole extremity. Extensive division of the surrounding soft parts was also present, which gave rise to an unusual amount of scar tissue.

Furthermore, it is interesting to observe that in these cases of reunited nerves the conductivity of cerebral impulses became established before the nerve was capable of transmitting the electric impulse. In one case motility was established fourteen months after the suturing, while electrical tests continue to give negative results. Motion returned in another case after twelve months, though the electrical reaction was scarcely perceptible.

An interesting observation made by Gleiss in his cases was that even when a nerve had been completely divided, the skin area supplied by that nerve, did not, in all cases, lose its sensibility. In one case of division of both median and ulnar nerves, in which the ulnar did not heal, there was absolutely no disturbance of sensibility for the first two years after the injury; while four years after the injury, when the median wound had been healed, the sensibility in the ulnar region became almost obliterated. Ziegler<sup>1</sup> states that "regeneration is almost complete by the end of the third month." The full return of function, however, requires a year or over. The following is a table of duration of healing in Gleiss' cases as far as they were observed:

<sup>1</sup> Lehrbuch der pathologischen Anatomie.

Suture of	Sensibility first observed after	Motility first observed after	Electrical response first observed after	Healing established after
I Median and Ulnar	2 months	3 mo., 10 days	. . . . .	5½ years
II Median	16 days, none	16 days, none	16 days, none	4½ years
III Median	Always normal	18 days, none	. . . . .	2 years
IV Radial	Always normal	1 month	12 mo., weak	12 months
V Radial	Always normal	2½ months	24 days faradic	1 year
VI Radial	16 days	3 months	2 mo., 16 days	6½ years
VII Median	1 month	2 mo., 11 days	. . . . .	2 years
VIII Median and Ulnar	Always present	1 mo. (median)	. . . . .	20 mo. (median)
IX Peroneal	1 month, 5 days	2 mo., none	. . . . .	14 months
X Radial	Always present	1 mo., 5 days	1 year, uncertain	14 months
XI Ulnar	25 days	2 mo., none	8 months	8 mo., improvement

It is impossible to say whether or no there is a difference in the time of healing between the primary and secondary operations. In these cases the time elapsing between the operation and the return of function was very variable.

The question as to whether a nerve can heal *per primam intentionem* is still *sub judice*. Wolberg<sup>1</sup> has made a number of experiments to discover whether a divided nerve can be made to heal without the peripheral segment undergoing degeneration. In all of his experiments degeneration took place. And in these four cases of Gleiss' of primary suture, although the ultimate results in all were good, still in none was there an immediate restoration of function.

JAMES P. WARBASSE.

<sup>1</sup>Deutsche Zeitschrift für Chirurgie, Band XIX.

## INDEX OF SURGICAL PROGRESS.

### GENERAL SURGERY.

#### **Treatment of Surgical Tuberculosis by Boiling Water.**

By Dr. JEANNEL (Toulouse, France). Jeannel reported four cases before the Academy of Medicine of Paris which he had treated with boiling water. Two cases were followed by a cure and the other two only by improvement. In the two cases of recovery where a successful result was obtained, the disease occupied cavities where the affected tissues were capable of retaining the boiling water for some time and thus constituting a method of sterilization capable of giving very favorable results.—*La Semaine Médicale*, No. 29, 1893.

### NERVOUS AND VASCULAR SYSTEMS.

#### **I. Pulsating Exophthalmos Following a Fracture of the Base of the Cranium; Direct Compression; Recovery.**

By Dr. PICQUÉ (Paris). Picqué reports the case of an old woman, of sixty years, who, after being run over by a cab, was picked up unconscious and with hæmorrhage from the right ear and nostril. Recovering consciousness half an hour after the accident, she began to complain, a few hours later, of violent headache and a painful sawing sensation above the right ear. Toward the sixth day he observed symptoms pointing to the development of a phlegmon of the right eye, with a very considerable swelling of the lid, very pronounced ophthalmia and a well-developed chemosis. At the same time she complained of acute lancinating pains in the eye. Eight days after the beginning of these symptoms the pain had become so unbearable that a puncture at the middle of the orbito-palpebral cavity was made

which only gave issue to a little blood, with little improvement. The next day the pains having aggravated the point of puncture was enlarged and only slight amelioration followed after a flow of blood. The next day pulsations with a thrill were made out, and an arteriovenous aneurism diagnosticated. Direct compression was tried, with success, so that in eight months the exophthalmos has considerably diminished, though very pronounced pulsations are to be seen at the inner angle of the eye. While the luminous perceptions have disappeared, the upper lid retains a certain degree of ptosis. Gayet, of Lyons, in the discussion that followed the presentation of this case before the Paris Surgical Society, mentioned a similar case, in a drunkard, who had received a violent injury to the cheek and entered the hospital without presenting any special symptoms in this eye. Several days later there developed an arteriovenous aneurism of the right side for which digital compression of the right carotid was done for several hours. Amelioration not setting in, ligature of the vessel was to be tried when a pronounced improvement became apparent and was followed by a progressive movement toward recovery, which was finally complete. He has observed another analogous case, with Prof. Tripier, where an exophthalmos developed spontaneously, for which no cause could be discovered. The patient died, and nothing abnormal was found either in the carotid artery or the cavernous sinuses. Prof. Tillaux had a patient under his care who had contracted an arteriovenous aneurism of the right eye after a pistol shot. Applications of ice produced great improvement and he was discharged.—*La Semaine Médicale*, No. 29, 1893.

**II. Diagnostic and Therapeutic Value of Puncture of the Spinal Canal.** By V. ZIEMSEN (Munich). As is known, Quincke, of Kiel, recommended puncturing the spinal canal in hydrocephalus in order to decrease the pressure by drawing off a portion of the accumulated fluid. Ziemssen has tried this procedure in several cases of tuberculous cerebro-spinal meningitis, brain tumors,



etc., and can confirm Quincke's statements. The operation is done during general anæsthesia. To increase the interspace between the vertebral arches the spine should be flexed. The fluid flows off more or less rapidly, according to conditions of pressure. In simple hydrocephalus the resultant fluid is clear; in a case of epidemic cerebro-spinal meningitis the fluid was turbid, with fibrine flocculi and diplococci. In both diseases, after tapping, the cerebral pressure decreased. In a case of tuberculous meningitis, after puncture, a pronounced improvement was noticed. In this case it was repeated four times. Diagnostically, possibly, examination of the fluid might yield definite results. Prof. Bruns, of Hanover, in three cases of cerebral tumors, in order to reduce pressure did extensive trepanation with good results in two cases. Quincke, who has performed the operation twenty-two times, said that one must not expect too great results to follow, as the fluid rapidly re-accumulates. From examination of the fluid obtained he has attempted to draw some diagnostic and prognostic conclusions. He found in simple hydrocephalus that the fluid contains less than 1 per cent. albumen; a per cent. above 1 per cent. speaks for an inflammatory exudate; one over 2 per cent. is sometimes found in tuberculous exudates. In one case with admixture of blood there was cerebral hæmorrhage, with penetration into the ventricles. The states of pressure vary greatly. He regarded the puncture as indicated in acute exudates of a serous or tuberculous nature. To prevent re-accumulation he makes a slit in the dura and institutes a sort of drainage. In two cases of chronic hydrocephalus in children, the fluid was continuously evacuated into the surrounding tissues. Ewald, of Berlin, finds puncture to bring about but transient improvement. Sahli, of Berne, has often done puncture in tuberculous meningitis. He introduces a small elastic catheter which may be bent up to stop the flow. A metallic tube easily becomes clogged with clots of blood. He recommends opening the canal more freely with the thermocautery. Naunyn, of Strasburg, has done the operation seven times. In one the fluid would not flow on account of its being purulent. He never has seen an

increased amount of albumen in tuberculous exudates. It is easily done; no anaesthesia is necessary, and the dorsal muscles do not impede one.—*Wiener Medizinische Presse*, No 19, 1893.

FRANK H. PRITCHARD (Norwalk, Ohio).

## HEAD AND NECK.

**I. Preliminary Ligation of the External Carotid in Operations Upon the Face.** By Dr. CHALOT (Toulouse, France). After having considered the inconvenience of ligaturing the common carotid, and its being followed, in a quarter of the cases, by softening of the brain, the writer proposes preliminary ligation of the external carotid in operations for cancers of the face and the upper portion of the neck. He goes into the details of the operative procedure, speaks of the uncertainty of finding the hypoglossal nerve, the importance of doubly ligating the superior thyroid vein which, if not cut between two ligatures, will inundate the field of operation, and render further progress difficult. He bases his considerations upon thirteen cases in which he has done this procedure within eighteen months.—*Le Progrès Médical*, No. 15, 1893.

**II. Contribution to the Treatment of Cleft Palate.** By Prof. KUESTER (Marburg, Germany). Kuester reported on his results in the treatment of cleft palate, before the German Society of Surgery, at their Twelfth Congress. He has, in all, operated on twenty-two cases, of which thirteen were females and nine males, and varying in age from two and a half to thirty-six years. The last ten patients were all cured by a single operation. He employs Langenbeck's method, anaesthetizing the patient and operating with the patient's head hanging down. He modifies the freshening up of the edges in that he pierces the middle of the uvula by a two-edged knife and forms a flap, extending on both sides, to the posterior border of the hard palate. In this manner the velum palati and the uvula are lengthened and broadened so that it is easily

applied to the bony surface. He avoids further cutting through the velum and severing the tensor palati, but rather does he incise the velum only so far as to cut the nasal mucous membrane with a button-tipped bistoury, where it passes over into the soft palate from within outward. Thus, any further incisions for relief of tension are rendered unnecessary. In applying the sutures to the uvula, a silk thread is passed through and held to act as a guide and to oppose tension. The whole operation lasts from one-half to three-quarters of an hour. The sutures are painted with iodoform-collodion, and a tamponade of iodoform-mull employed in case of profuse hæmorrhage, and then only a few minutes. Thus primary adhesion to the exposed bone is more certain to follow. He rejects Julius Wolff's method of making lateral incisions, with employment of silver wire sutures to relieve tension, as disadvantageous, and to favor lateral defects. Daily irrigation of the nose is also unnecessary. Wolff's operation in two sittings for the prevention of atrophy of the flaps is only justifiable in case of a very broad fissure and very narrow flaps. To avoid gangrene of the margins of the wound he has used in several the tertiary silver wire suture. One can assist the healing of the wound by painting it with tincture of cantharides, and then, if complete closure does not take place, the granulating edges may be closed with silver wire sutures. In nervous patients it is advisable to use a buccal dilator and anaesthesia. If a small spot remain open it may be helped to close by the tincture of cantharides. In order to obtain a good functional result, it is not only necessary to obtain a complete closure of the palate and a sufficiently large uvula, but also of a proper training in speaking. Speech training, according to Gutzmann, should even precede the operation. Two cases treated after this method succeeded in obtaining ideal speech. Out of the other seven five had normal speech, one was only moderately improved and another remained uninfluenced. The writer is of opinion that it is not advisable to operate as early as possible, for he does not consider it dangerous to life, and the aural and pharyngeal and laryngeal catarrh, which often complicate, rapidly retrogress,

even in later life. He looks upon the fifth to the seventh year as the most appropriate time to interfere.—*Wiener Medizinische Presse*, No. 18, 1893.

### III. Voluminous Enchondroma of the Parotid Gland.

By Dr. LEVRAT (Paris). The writer removed an enormous enchondroma, weighing six kilograms, from the parotid region of a man sixty years of age. The tumor had been developing for ten years. Its removal was accompanied by a profuse hæmorrhage, and necessitated the ligation of forty-five arteries, of which five or six were as large as the carotid. In spite of this the patient made a good recovery, though it recurred after two years.—*La Semaine Médicale*, No. 23, 1893.

### IV. Contribution to the Study of Injury of the Uppermost Vertebrae.

By Dr. BERNDT (Vienna, Austria). The writer describes the case of a woman, seventy-nine years old, who fell head-long down a flight of stairs, fracturing the odontoid process of the atlas, and determining a right-sided luxation of this bone, with consequent compression of the right side of the cord. The patient lived thirty-one days, and the necropsy confirmed the diagnosis. The clinical phenomena were, on the side of the lesion motor and vaso-motor paralysis, with increased sensibility, while an anæsthetic zone above the hyperæsthetic region, with a hyperæsthetic zone above this, were lacking on account of the high situation of the injury. The patellar and plantar reflexes were, at first, decreased on the right side, but later the opposite was remarked. On the contrary side, opposite to the lesion, there was complete anæsthesia up to the margin of the chin without a hyperæsthetic region above this. At the same time active motility was retained, only lifting the left arm being somewhat difficult during the first three days. At first, the patellar and plantar reflexes were normal, but later, weaker than on the right. Less characteristic sensations were pain in the back of the neck, transient, and in the left arm, which later were nearly

constant, slight albuminuria, obstinate constipation and retention of urine; from the fifteenth day there was complete paralysis of the intestines. The right pupil was very small, while the left was dilated. It was interesting to note that the decubital bedsores were larger and increased in size more rapidly on the side where sensation was paralyzed than the other, though she laid exactly flat upon her back.—*Wiener Medizinische Presse*, No. 18, 1893.

FRANK H. PRITCHARD (Norwalk, Ohio).

#### CHEST AND ABDOMEN.

**I. Incision and Drainage of the Pericardium in Purulent Pericarditis.** By R. SIEWERS (Helsingfors, Finland). The pericardium has only lately been the object of operative interference, yet this question was early discussed. Riolanus (1653) was the first who spoke of the possibility of opening the pericardium, advising trepanation of the sternum. Senac (1794) proposed puncture by means of a trocar. Desault, at the beginning of this century, attempted to operate on a case, but it turned out to be a false diagnosis, a pleuritic exudate. Romero, of Barcelona, operated on three cases, in 1819, by incision in the fifth intercostal space; two of his cases recovered. In the meantime, it was only after 1840 that an adequate number of cases had accumulated. Roger (1875) found paracentesis of the pericardium indicated in very large exudates and in primary purulent pericarditis. Hindenlang (1879) claims the operation to be indicated in idiopathic and secondary, rapidly developing, pericarditis as well as in the hæmorrhagic form, as seen in scurvy and purpura hæmorrhagica. West (1883) refers to seventy-nine cases, with thirty-six recoveries. He states that paracentesis is a justifiable operation, and that it can be done without any great danger, that the best point of puncture is the fifth intercostal space, an inch from the left border of the sternum. Billroth (1882) rejected the operation and spoke very decidedly against it. Fevrier (1889) sets forth the following indications: (1) When the exudate reaches

such a degree that life is threatened ; (2) when it is purulent or has undergone changes. In the first case aspiration will suffice, it being done in the fourth or fifth intercostal space, a few centimetres from the left border of the sternum. In the second condition pericardotomy is performed, an incision in the fifth intercostal space, a slight distance from the sternum, the pectoral and intercostal muscles are cut through, a trial puncture being first made and followed by opening of the pericardium and drainage. Siewers' paper is based especially upon purulent pericarditis. He considers nine cases, one operated at the clinic in Helsingfors and eight from the literature. He emphasizes that a puncture, in purulent pericarditis, has only a palliative action. One must incise and drain. In four of the cases recovery followed. In these four the disease was either primary, or only complicated with left-sided pleuritis. In the other five, there were two with general pyæmia. An incision is made in the fourth or fifth intercostal space, cutting through the outer layer of muscles and the intercostals ; a finger is introduced and the tensely distended pericardium is felt, a trial puncture being made to ascertain whether it really contains pus. Then it may be incised with the knife or cut into by means of the shears and forceps. By pushing a finger into the opening too rapid evacuation of the contents may be avoided and the heart felt to pulsate, so that thus one is certain that the pericardiac cavity is opened. The incision is enlarged a few centimetres and two short drainage tubes placed in the wound. No resection of the rib is necessary. In the majority of the cases the operation was performed in the fourth intercostal space, two or three centimetres to the left of the sternum. Care should be taken not to injure the internal mammary artery, which courses nearer to the sternum, nor to open the left pleural cavity. After evacuation of the pus the widely distended pericardium is prone to retract so that the opening externally and the incision in the pericardium will not correspond, and free efflux of the exudate may be obstructed. Irrigation of the cavity is not advisable. The conclusions derived from this small quantity of material are as follows :



(1) Incision with drainage, in purulent pericarditis, is fully justifiable, and is the only means of saving the patient's life. Its performance does not disturb the heart's action.

(2) In many cases operation may bring about complete recovery—four out of nine cases. In pyæmic infection it relieves the patient and prolongs life.

(3) The operation should be done in the fourth or fifth intercostal space, two centimetres to the left of the sternum. Drainage is necessary. Irrigation should not be done.—*Norsk. Magazin for Laegevidenskaben*, No. 4, 1893.

**II. Bronchiectasia of the Apex of the Right Lung; Pneumotomy; Recovery.** By PROF. HOFMOKL (Vienna, Austria). A packcarrier of forty-three who, beyond an attack of small-pox in 1886, had always been well, had been since five weeks subject to slight febrile movements, right-sided thoracic pains and cough. For three weeks his breath had been fetid as well as his sputa. In consequence he complained of anorexia, insomnia and emaciation. He was strongly built, well nourished and with a good healthy color. The pectoral fremitus on the right was somewhat weaker than on the left. In the right first, second and third intercostal spaces the percussion sound was nearly tympanic to the mammary line. Auscultation revealed, in the first intercostal space, near the sternum, bronchial respiration. Between the first and second ribs distinct amphoric buzzing. The expectoration was very profuse and of a putrid color. No tubercle cells to be discovered. A solution of methyl violet was injected into the second intercostal space which soon appeared well mixed in the sputa. An operation was determined upon, as internal treatment was without results. An incision nine centimetres in length was made in the second intercostal space, running parallel with the ribs and extending down to the pleura, which was penetrated by a pointed thermocautery. A few grammes of purulent and putrid pus immediately flowed from the wound; no air issued. A probe

reached resistance at a depth of three centimetres. Drainage and iodoform dressing. Slight hæmorrhage from the lung. The expectoration decreased in quantity; air issued from the wound; two days after in a stream. He began to improve in appetite and sleep, his cough disappeared, and in eighteen days from the time of the operation he was discharged, cured. He has gained in weight, and looks excellent. There remains but a slight dulness on percussion in the upper part of the right lung. The respiration, on auscultation, is normal.—*Wiener Medizinische Presse*, No. 18, 1893.

**III. Extirpation of an Hepatic Tumor.** E. v. BERGMANN (Berlin). V. Bergmann, at the eleventh meeting of the German Surgical Society, in speaking of surgery of the liver, presented a case of hepatic tumor where extirpation was performed with success. The diagnosis was uncertain. An echinococcus was thought to be present, for the growth was situated in the median line, of a globular form, in the umbilical region and not tense and hard. It would rise up with the liver, and be out of sight for hours at a time. At the operation it was found to contain some nodules, and not to be connected with the liver itself. The tumor, which was as brown as the liver itself, was lifted out of the wound with ease, was found to be connected with this organ by means of a pedicle, five centimetres in length, and four in thickness, which was simply severed and the larger vessels secured. Iodoform gauze was then placed upon the wound according to v. Eiselsberg's procedure, a portion left open and a strip of the gauze to hang out. No suturing nor cauterizing the wound by the thermocautery was attempted, as grave hæmorrhages have been known to follow even this. It is impossible to suture the capsule, as the substance of the liver is too brittle. On the third day tampon was removed, and, after renewal, definitely on the ninth day. The empty space left by the sinking back of the liver was carefully tamponaded according to Mikulicz. The tumor was discovered to be a tubulous adenoma. These tumors and primary carcinomata are

rare hepatic growths, and their differentiation is by no means yet clear. Prof. v. Bardeleben, of Berlin, in the discussion following, reported a case of sarcoma of the abdominal walls which had grown into the liver. It was removed by a wedge-shaped incision, the wound tamponaded and the abdominal wound left open. The patient has been for two years without a recurrence. In this case also the sutures through the hepatic substance would not hold. Prof. Czerny mentioned a case of gummos tumor of the liver which was removed, with success, by his assistant, Benno Schmidt. The prognosis of hepatic tumors is relatively favorable. Prof. Koenig observed, with regard to the technique, that, in extirpation of an enormous hepatic tumor filling the entire abdominal cavity, he separated the serous investment high up on the pedicle, removed it subserously, controlled the hæmorrhage with the thermocautery and sutured the serous surfaces. He excises small tumors with a wedge-shaped incision and sutures. Suturing would seem to him the ideal method, and it is desirable that the abdomen be then closed. Kuester, of Marburg, recorded a case where the result was not so favorable. A carcinoma of the gall bladder and liver was pierced at the upper part of the tumor and a heavy piece of tubing drawn through, and thus hæmorrhage controlled. The growth was then placed outside the body but not removed. The patient died from septicæmia; hence he recommends, after implication of the elastic ligature, to remove them. In 1890 this question was discussed. Wagner, Lauenstein and Tillsman reported cases in point, while Ponfick, of Breslau, proved, by experiments upon animals, that the hepatic substance was regenerated. In spite of that, reports of operations are infrequent. Langenbuch has removed a constricted lobe of a liver, v. Eiselsberg a cavernoma of the right lobe, and v. Hochenegg operated on a secondary carcinoma of the liver, originating in the gall bladder.—*Berliner klinische Wochenschrift*, No. 17, 1893.

FRANK H. PRITCHARD (Norwalk, Ohio).

## GENITO-URINARY ORGANS.

**I. Incomplete Paraplegia of the Lower Limbs and Pseudo-Locomotor Ataxia from Phimosis; Operation; Cure.** By SOLON CHROMATIANOS (Athens, Greece). The writer records the case of an officer of the Greek cavalry, fifty-eight years of age, of healthy antecedents and with a negative history, who, in consequence of a balanoposthitis, had contracted an extreme phimosis. He treated the disease himself by astringent injections, in consequence of which his prepuce had, six months before, contracted down so as scarcely to admit a pinhead. Nervous symptoms then appeared; a progressive weakness of the lower limbs, dysuria, from accumulation of the urine between the glans and prepuce, which was only to be expelled with violent efforts. This extended into a complete paresis of the sphincter vesicæ, so that his urine dripped continuously day and night. He also presented well-developed ataxic symptoms, as instability of movement, disturbances of insensibility in the soles of the feet, impossibility of walking backward, while, on closing his eyes or in the dark, he would totter. Patellar reflex abolished and a fixed pupil. Urine normal on examination. Circumcision was done, and a large-sized sound introduced with ease. This was removed on the fifth day after the operation. Fifteen days after the vesical disturbance began to improve, and in a month he could retain his urine the entire night, and urinate normally. The ataxic phenomena improved after the vesical symptoms began to become better, and forty days after the operation he departed for Thessaly, where he went on active duty, making long marches without fatigue or any ataxic or paraplegic symptoms becoming manifest. Shortly before his departure he was examined and the patellar reflex found to have reappeared and his pupil to react normally.—*Le Progrès Médical*, No. 15, 1893.

FRANK H. PRITCHARD (Norwalk, Ohio).

**II. Catheterization of the Ureters.** By H. A. KELLY, M.D. (Baltimore). By catheterization of either ureter we are able to secure, isolated, the urine from the respective kidney of that side,

containing evidence of the disease of the ureter, pelvis of the kidney, or the kidney itself above the catheter, according to the microscopic character of its sediment, associated with the history and physical signs.

The following routine in catheterization should be observed: First, all the urine in the bladder is drawn off and put to one side, then the bladder is distended with 150 to 200 c.c. (about six ounces) of a methyl-blue solution. It is now evident that if the catheter enters the ureter in the catheterization and clear urine is discharged by the catheter it does not come from the bladder. There is one possible source of error—when the lower part of the ureter is so distended that the water from the bladder backs up into it and so escapes through the catheter; this will be obviated by carrying the catheter still higher up.

The usual method of introducing the catheter is by retracting the vaginal wall and introducing the ureteral catheter into the bladder, and turning its point forward and trying to introduce it by observing the play of the point of the catheter over the anterior wall, as it seeks the ureteral orifices in the ureteral folds described by Pawlik in *Langenbeck's Archiv.*, Band XXXIII, Heft 3. The ureters lie a little above or in the upper part of this fold, one or two centimetres to the right and left of the median line.

The urine does not begin to escape from the catheter at once; sometimes it is three or four minutes before beginning. Time must be allowed for it to fill the lumen of the catheter before it begins to run out, and the urine in the catheter must be added to that collected.

The catheter is kept from collecting fluid from the bladder during its introduction into the ureter by coating the metal plug which stops the end with a little vaseline, thus rendering it air-tight. As soon as it is in the ureter the plug is withdrawn.

The urine flows by gushes at intervals of ten or fifteen or thirty seconds. It is evident from this that the urine collects in the pelvis of the kidney, passes into the ureter, and is forced down by a peristaltic wave more or less rhythmic in character. It would appear to

inspection like a little bolus being swallowed. It is thus forced into the bladder in intermittent jets.—*Annals of Gynecology and Pædiatry*, May, 1893.

#### TUMORS.

**Treatment of Nævi by Sublimate Collodion.** By Dr. CÆSFELD (Barmen, Austria). The writer recommends sublimate collodion (1 : 8) in the treatment of vascular nævi. It acts with certainty, is painless and rapid. No disagreeable side action has been observed. The procedure is as follows: A moderately thick coating is applied over the nævus and 1–2 mm. over on to the surrounding skin. Then blow on the collodion in order to aid its drying, and repeat the procedure once or twice, according to the size. Be careful to see that the patient's friends are cautioned about protecting this coating from any injury, as in washing. In ten to twelve days this falls off and leaves a dry, white, superficial and smooth cicatrix. In case a few groups of vessels remain in the scar, repeat it again until it has completely disappeared. This method is also applicable in larger teleangiectases.—*Ärztlicher Praktiker*, No. 13, 1893.

#### BONES, JOINTS, ORTHOPÆDIC.

**I. Treatment of Myelogenous Sarcomata of the Long Bones by Resection.** By Dr. NEUMANN (Halle). Neumann presented a woman twenty years of age at the twelfth meeting of the German Surgical Society who had fallen down several steps and received a slight injury of the left knee, which fourteen days later had become more painful, with a tendency to collapse at times. The next year she was able to walk only with the aid of a cane. The physician who treated her made an incision below the patella and proposed amputation, which led her to enter the hospital. This incision, which was seven centimetres in length, and crossed by another of five in length, exposed a dirty, gray, immovable mass that proved to be a giant cell



sarcoma. At the opening of the wound the tibia fractured at four fingers' breadth below the joint. After lateral incisions had been made the articulation was opened. The whole upper portion of the tibia was found to be a cancerous mass. Extirpation of all suspected tissue was done, the articular surfaces of the femur and five centimetres of the tibia were sawed off. The remainder of the tibia was cut down to a point and inserted into a corresponding hole which was bored into the condyle of the femur. Suture, drainage and a plaster bandage. In three months the patient was discharged, with a prosthesis. Four months after consolidation was still complete.—*Wiener Medizinische Presse*, No. 18, 1893.

FRANK H. PRITCHARD (Norwalk, Ohio).

**II. Hereditary Luxability of the Elbow Joint.** By P. A. KELLY, F. R. C. S., Irel. (Barry, Cardiff). A man in youth dislocated his right elbow joint, and in the following year sustained a like injury to the left. These dislocations were not reduced, and for some time he complained of numbness in both hands. The feeling was accentuated in the little finger and half the ring fingers of both hands; apparently the ulnar and musculo-spiral nerves were implicated. He began to waste and the forearms became mere skeletons. Twenty years ago one of his sons dislocated the left elbow, the injury being diagnosed at the time as a fracture, but pulled into place a few months later. Eight years ago another son received a like injury, which was similarly treated and maltreated. The author's patient, a third son, sustained a dislocation at the right elbow joint.—*London Lancet*, February 25, 1893.

JAMES E. PILCHER (U. S. Army).

**III. Extirpation of the Ankle for Club Foot.<sup>1</sup>** Gulde reports nineteen cases of extirpation of the ankle performed in Bruns' clinic up to the year 1890. Only those cases are reported which have not been lost sight of since the operation. The length of time during which these cases have been observed varies from nine months

<sup>1</sup> Beiträge zur klinischen Chirurgie, Band X, Heft 2, 1893.

to five years. He calls attention to the fact that though many of the operations for club foot give a beautiful cosmetic result, in a short period of time after apparatus and support have been laid aside recurrence of the deformity takes place.

The method of excision of the ankle, as performed by Prof. Bruns, is as follows: The operation is performed under narcosis and by the bloodless method of Esmarch. The skin incision is begun at the tibio-fibular articulation and carried with a slight anterior concavity ten centimetres downward over the prominent talus as far as beneath the medio-tarsal joint, dividing skin, fascia and crucial ligament. The tendons of the extensor digit, longus and brevis are lifted out of their beds and drawn inward. The capsule of the joint is then incised for its entire extent. The capsule with the insertions of the ligaments are separated from the bone, the head and neck of the astragalus are laid bare, and the astragalo-scaphoid ligament divided. The foot is then supinated as far as possible, and the three fasciculi of the external lateral ligament of the ankle joint divided. An elevator is then passed behind the neck of the astragalus, and as the bone is lifted outward its remaining attachments are divided, and it is removed. When there is difficulty in making the articular surfaces of the calcaneus fit into the spaces between the malleoli, a plate of bone may be removed from the inner surface of the external malleolus. The wound is then closed, and over the dressing a plaster bandage is applied. At the end of eight days this is removed in order to take out the sutures; the position of the foot is corrected and put again in a permanent plaster dressing. The after-treatment in plaster is continued for six or eight weeks, and after that the patient is given an ordinary lace shoe with an elevated sole.

The following observations have been made on these cases of Gulde's:

1. *The Position of the Plantar Arch in Walking.*—In eleven of the cases operated upon the patients planted the feet squarely on the ground. The remaining patients walked more on the outer border of the feet, and though not cured of their disease were much im-

proved. These imperfect results are in part due to the improper and often too short a period of after-treatment after leaving the clinic.

2. *The Adduction of the Foot.*—As far as this author has observed the size of the angle of adduction bears no relation to the functional power of the foot.

3. *The Shortening of the Leg.*—This is practically due to the extirpation of the astragalus, though usually it is due, in the paralytic form of clubfoot, to an aphasy of the bones. In many cases, also, the scaphoid bone is elevated until it presses upon the tibia. The shortening which this causes is, however, unimportant.

4. *Observations on the Secondary Mobilization of Lisfranc's Joint.*—The removal of the astragalus usually destroys the function of the ankle joint. Occasionally there is some motion, which remains between the calcaneus and scaphoid, and calcaneus and leg. The movement in Lisfranc's joint in many club feet is even greater than in normal feet. This is especially true in those which have been treated by forcible reduction.

5. *The Hollow Foot.*—Notwithstanding the removal of the astragalus and the tenotomy of the plantar fascia, a degree of hollow foot remains in many cases, quite as pronounced as in the uncorrected foot. Gulde is inclined to think that this is due to the upward extension of the scaphoid bone. Another cause is the shortening of the inner border of the foot.

The results obtained in the nineteen operations performed upon fifteen patients are classified in three groups:

1. Four patients, of whom two underwent double resection of the astragalus, can run and jump the whole day without any pain. The position of the feet is excellent.

2. Five patients can walk for six hours without becoming especially tired, and without causing any especial discomfort in the feet. One of these underwent a double operation. The position of the foot in these cases is good, resting squarely on the floor. The remaining patients step on the outer border of the foot. Angle of adduction,  $30^{\circ}$  to  $40^{\circ}$ .

3. The final six cases can walk two or three hours without especial inconvenience. In two of these cases the foot is planted squarely on the ground. The others walk on the outer border of the foot. Angle of adduction,  $20^{\circ}$  to  $45^{\circ}$ .

The great feature in all of these cases is that no orthopædic after-treatment had to be carried out. The patients remained in the hospital a few weeks, and at the end of two months were given simple lace shoes.

JAMES P. WARBASSE (Brooklyn).

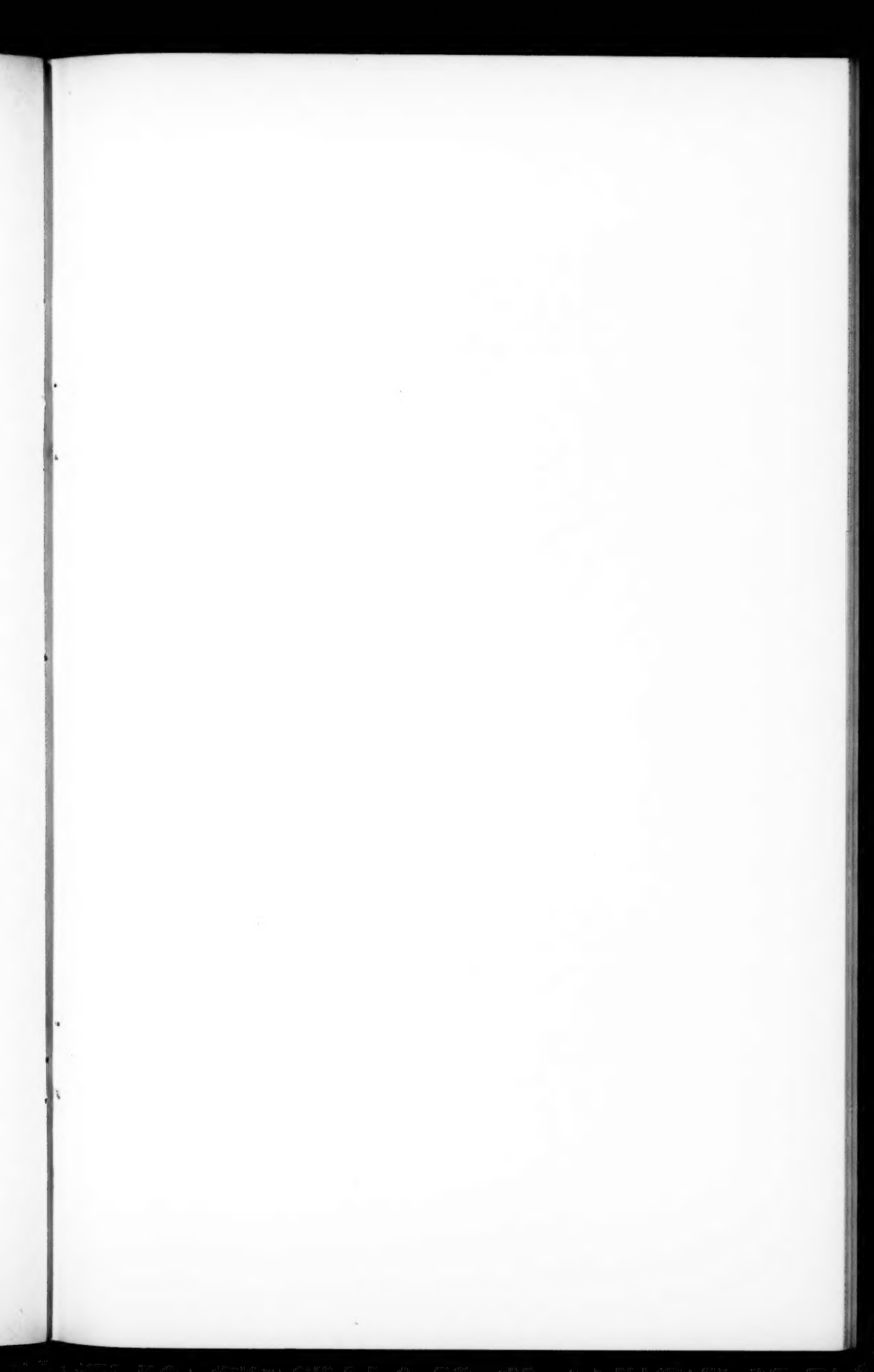
#### GYNÆCOLOGICAL.

##### I. Operative Treatment of Uterine Myo-fibromata.

By H. J. BOLDT, M.D. (New York). In a paper read before the American Gynæcological Society in May, 1893, the author advocates the frequent total extirpation of the fibro-myomatous uterus. His experience with the use of electrolytic efforts in such troubles has not been good; in a number of instances by the use of the galvanic current he has secured the diminution of pain and hæmorrhage; in others not only was the treatment negative in its results, but was even followed by aggravation of the patient's sufferings—twice in his own practice and thrice in the practice of others has he seen the electric current provoke suppuration in the tumors. In submucous and subperitoneal tumors he declares electricity to be useless.

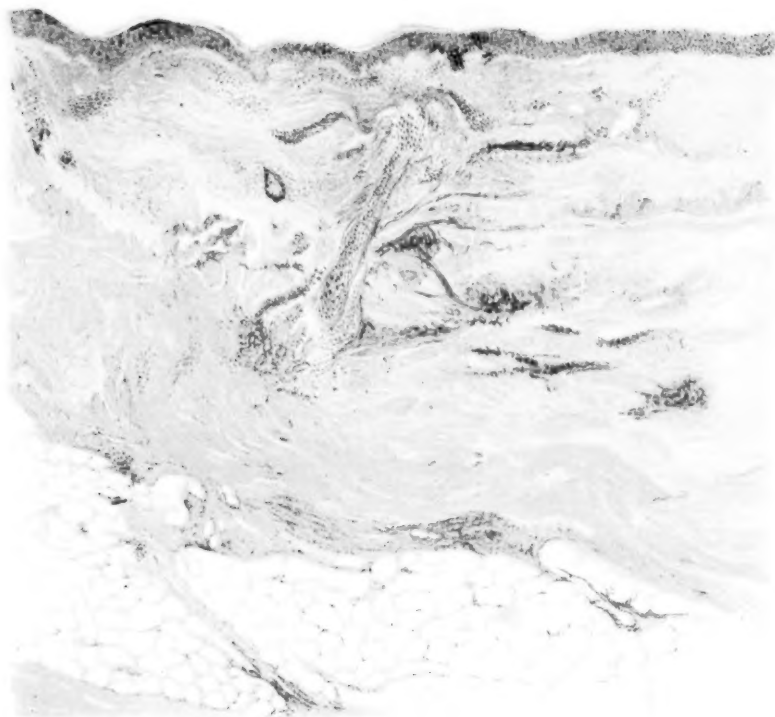
Out of 321 patients afflicted with myoma of the uterus sufficient to produce such symptoms as to compel them to seek advice, in fifty-seven, or 14.45+ per cent., did he advise operation for the removal of the growth. In twenty-one of these total extirpation of the affected organ was done. The author gives the details of these cases. In seven instances the operations were followed by death; from acute mania and from pneumonia and chronic nephritis, in each one case; from shock of operation in three cases; from pre-existing anæmia combined with the shock of operation in two cases. In a number of the cases the operator began from below through the vagina by detaching the vagina from the cervix, separating the bladder from

the uterus as far up as could readily be done, and finally opening into the cul-de-sac of Douglas. This procedure he recommends, especially when the growth is crowded down into the pelvis and the pelvic floor is rigid, or if there is no intraligamentous growth, or if the portio vaginalis is low in the vagina, and the vagina is sufficiently spacious to work in. The remainder of the operation is conducted through the usual abdominal incision. The broad ligament is tied off with catgut and the peritoneal edges of the pelvic wound are sutured. In most cases a vaginal drain of iodoform gauze was used, but he has lately abandoned this as unnecessary, although vaginal discharges, more or less profuse and offensive, attend the convalescence.—*Abstracted from author's proof.*

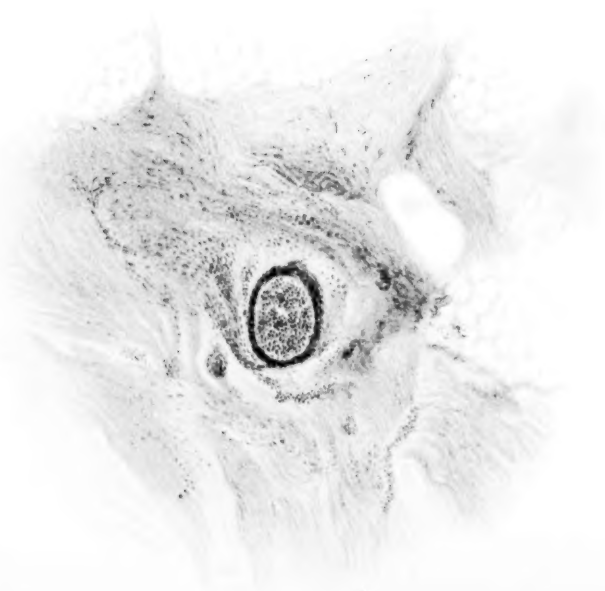




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## HYPERTROPHIES AND DEGENERATIONS OF CICALICES AND CICATRICAL TISSUE.<sup>1</sup>

By JOHN COLLINS WARREN, M.D.,

OF BOSTON.

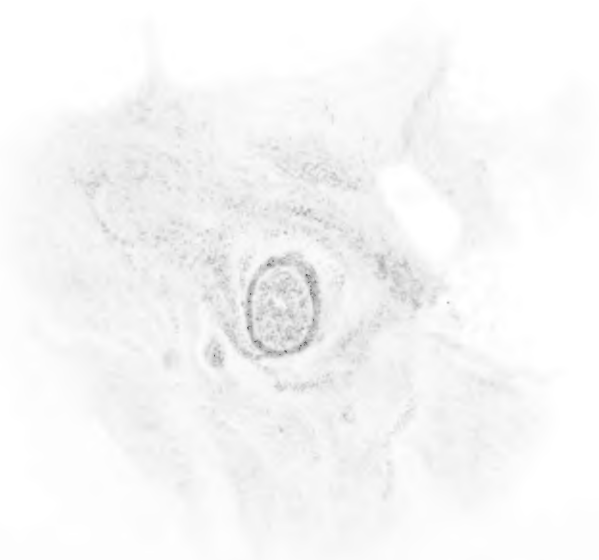
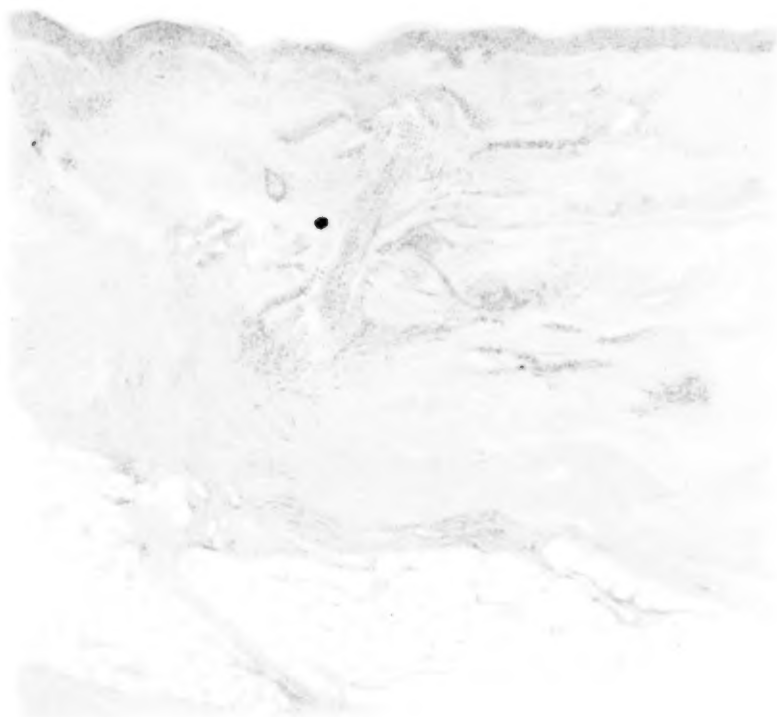
PROFESSOR OF SURGERY IN HARVARD UNIVERSITY; SURGEON TO THE MASSACHUSETTS GENERAL HOSPITAL.

THE material by means of which a defect in the integuments is repaired is known as a cicatrix, and consists of a new formation of connective tissue covered by epidermis. In tracing the evolution of this new tissue we find that it is formed from the fixed cells of the connective tissue and from the cells found in the walls of the small bloodvessels. These cells, when in a state of reproductive activity, are known as fibroblasts, and it is from them that the new tissue is formed which firmly holds the edges of the wound in apposition.

The process does not, however, cease with the closure of the wound, for if we watch the cicatrix during the next few weeks we find that the line of union has, in many cases, become much more marked, and that it is the seat of a distinct growth of tissue by means of which it is raised above the level of the surrounding skin. There is an increase in the vascularity of the part, and the bright red color which results gives it an unusual prominence, which threatens, when the scar is situated in exposed regions, to become the cause of an unsightly deformity. The new formation appears, however, to be merely a provisional one: gradually the swelling diminishes, the new tissue shrinks back to the level of the surrounding integument, and the bright color fades away.

If we examine a wound at the end of the first week of the healing process we find remarkably little change in the tissues.

<sup>1</sup> Read before the American Surgical Association, May, 1893.



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A line of small round cells, which take the staining fluid readily, serves to indicate the point in the section where the edges of the wound have been brought together, but there is as yet no further change. It is not until the end of the second or third week that the tissue, known as cicatricial tissue, can be found, and the period of full development is really much later than has usually been supposed. In fact, it would not be an exaggeration to say that the process of cicatrization requires a full year for its complete evolution, that is, for that point to be reached at which no further changes are likely to take place.

At the end of a few weeks, however, we are able to see a well-developed cicatricial tissue. This consists of a connective tissue and an epithelial portion. The fibres of the connective tissue are packed together in bundles which interlace one another in various directions. At times the fibres run singly in very small bundles and are so interwoven as to form a felt work. This is in striking contrast to the arrangements of the fibres of the adjacent corium.

The elastic fibres, which are twisted about the bundle of fibres in the normal cutis, are wanting, being rarely replaced when once destroyed.

The interlacing bundles of fibres leave no space for adipose tissue or glands, and give to the cicatrix its characteristic density. Old scar tissue is sclerotic and does not color as readily as the normal cutis, and we see comparatively few cells, but in the early stages of development the cells are numerous, and can be found in clusters here and there, surrounding the bloodvessels which run between the bundles of fibres.

The papillæ are never completely reproduced, and we see at certain points wavy lines of epidermis underneath which loops of vessels lie, but these are not genuine papillæ. A thin layer of epidermis, the lower border of which is represented by a more or less horizontal line, is the usual covering of a scar.

The glands are not entirely destroyed, as many of them lie deep. The ducts of the sweat glands may often be seen on the surface of scars, and hair follicles, with lanugo hairs and sebaceous glands, are occasionally seen. These epithelial structures often play an important part in the epidermization of a cicatrix.

The vessels of a fresh scar are very numerous, particularly the capillaries. If the wound has united by first intention they run horizontally, but if the wound has closed only after a slow process of granulation the vessels, generally speaking, ascend vertically toward the surface, and form there a rich anastomosis, which gives to the scar its characteristic hue. (Winiwarter.<sup>1</sup>)

Lymphatics are not usually found and nerves are rarely seen, although Robin describes them, and Jobert attributes the sensitiveness of some scars to rudimentary nerves which form there. The occasional presence of a large nerve fibre may give rise to more serious symptoms. The color of a scar may become a bluish red or violet; it gradually becomes paler and assumes a yellowish tinge, and finally a pure white. More rarely there is a deep yellow or brownish color, or some deeper pigmentation. It may have a mottled appearance, due to the presence here and there of patches of epithelial cells in the granulating surfaces. The presence of grains of powder produces a marked discoloration. Scars rarely disappear entirely, although this occurs not infrequently in scars formed during early childhood. Usually they remain as a fine, white line; or, if the scar has stretched, as it frequently does when there is tension, the line becomes a band. Scars grow in proportion to the rest of the body. Nélaton cites the case of a cicatrix, in an infant, reaching from the wrist to the elbow, which later in life covered the same distance.

William Adams<sup>2</sup> calls attention to this peculiarity of scars, and mentions the case of a child who, at the age of two years, was operated upon for club foot, a scar two inches long being left. When examined at the age of ten years the child was found to have a scar three inches long. A second case was that of a young lady nineteen years of age who, when one year old, had had a deep-seated nævus removed from the neck. The scar immediately after the operation was one and a quarter inches long and three-quarters of an inch wide. At the time the case was seen by Mr. Adams the scar was one and a quarter inches wide and three inches long. In eighteen years it had more than doubled in size.

<sup>1</sup> Deutsche Chirurgie. Lieferung 23.

<sup>2</sup> Trans. Pathological Society, London, 1860, Vol. xi.



Mr. Adams observes that the rate of growth, as demonstrated in these cases, did not appear to be sufficiently known to surgeons, or considered by them when performing operations on children in exposed portions of the body, the opinion being that scars remain stationary or wear out. It is true that the scars of some slight wounds do wear out to a certain extent, but after deep wounds, and when a portion of the skin has been destroyed, the cicatrix appears to be persistent through life, and to grow *pari passu* with the rest of the body, or rather with the portion of the body on which it may be placed. Vaccination scars are undoubtedly often much enlarged by growth.

Paget says :<sup>1</sup> "The scar of a child, when once completely formed, commonly grows as the body does, at the same rate, and according to the same rule : so that a scar which the child might have said was as long as his own fore-finger will still be as long as his fore-finger when he grows to be a man." He adds, however, that there is in youth a tendency toward the healthy state. Hence cicatrices after long endurance and even much increase may, as it is said, wear out, and thickening and induration of parts may give way, and all become pliant and elastic.

The scars formed in early operations, as in case of hare-lip, show greater deformity with the growth of the individual. Minute displacements are magnified by the enlargement of the part, and the tension gives rise to a thickening of the scar tissue which may be permanent. This is the principal deformity in the lip of a young lady which was operated upon when she was a few hours old.

According to Panas, locomotion of scars may take place. A small scar near the eyelid in infancy rose gradually with increase in years, until it was situated close to the roots of the hair.

The so-called false scars or striæ seen in the skin after pregnancy are due, according to Winiwarter, to a displacement of the elastic fibres. Instead of the thick bundles ordinarily seen there is a coarse mesh-work.

<sup>1</sup> Paget, Surgical Pathology, Vol. I, p. 49.

The appearance of scars often betrays their origin, and may in this way serve a valuable medico-legal purpose. The surface of burns is irregular: bridges and depressions are due to the unequal amount of destruction caused by the agent employed.

Suppuration has a decided influence upon the appearance of a scar, as it causes a corresponding loss of substance. Pathological scars are recognized partly from the appearance of the scar itself, and partly from the surrounding conditions. Ulcerations may be present near a scar which may give a hint as to its origin. Depressed cicatrices indicate that the deeper tissues have been involved, and are suggestive of bone disease of long standing.

The linear cicatrix of an incised wound, if left to stretch, may become a broad spindle-shaped scar.

Punctured wounds leave a linear scar parallel to the direction of the line of cleavage of the skin.

The most striking peculiarity of scar tissue is its tendency to contract. This contractile power exerts its influence during the healing process in a beneficial way, distant margins of wounds being brought nearer together, and the covering of the defect by epidermis being greatly facilitated. It is also the cause of the most striking deformities which disease can produce. So irresistible is its power that everything yields before it. Tendons are bound down into hopeless inactivity, nerves are held with an iron grip; the breasts may be so distorted that lactation becomes impossible; limbs are rendered useless, the trunk is bent upon the extremities, and even the solid bone is moulded into fantastic shapes.

What is this hidden power? What peculiar conditions of tissue exist which endow it with such precocious qualities?

Delpech has suggested that the contraction of scar tissue was due to a condition which allied it to muscular tissue. According to Panas we must regard cicatricial tissue as a provisional growth which is intended to preserve union until the edges of the normal skin have been regenerated. The absorp-

tion of this transitory structure is the final stage of the healing process. If the normal tissues are not reproduced only one act in this process is accomplished, and it is this attempt at absorption which brings about the great condensation of the scar tissue.

Looked at from this point of view, we see why it is that hypertrophied cicatrices are produced when the edges of the wound retract from some cause or other. The abundant formation of new tissue is an exaggerated effort on the part of nature to supply the necessary covering for the part. If the cicatricial tissue possessed any specific contractile qualities we should find a subsequent approximation of the edges of the wound, which is not the case. A broad, flat scar is usually the eventual outcome of such conditions. And we find this tissue so yielding to steady pressure that in wounds of the abdominal wall, when accurate adjustment of the edges of the wound has not been effected, the intervening scar tissue yields, and a hernia results.

It is only when there is an extensive loss of substance that the effects of contraction become perceptible. Moreover, this shrinkage begins even before the cicatricial tissue is developed, for we see the approximation of the edges of a large defect during the process of granulation. Contraction is here evidently due to absorption. The contractile power of a scar is, according to Robert Jones, largely dependent upon the amount of granulation tissue which becomes organized: all in excess of local demand adds to its contractile power.

Regarded from a physiological standpoint, scars may be divided into three classes, viz.: Hypertrophied scars, or those due to an excessive formation of cicatricial tissue; contracted scars, or those due to an attempt at absorption of larger cicatricial surfaces, and, finally, the normal scar, which represents the more or less imperceptible tissue which forms the line of union of the well-adjusted edges of a wound.

Scars ordinarily are not painful, for, as we have already seen, nerves are not usually found in them. Scars may, however, become a source of pain by their adherence to structures which are sensitive, as bone or nerve trunks and fibres. Some

observers, as we have seen, have found nerve filaments in the scar tissue, and Follin speaks of neuromatous enlargement of nerves in scars.

Weir Mitchell<sup>1</sup> speaks of cicatrix pressure on nerves as unusual, and mentions, as one of two cases which came under his observation, the presence of a cicatrix close to the sciatic nerve, so that whenever the leg was straightened the man suddenly lost power and suffered pain. Pressure may also be brought about by contractions, which leave the limb in an abnormal position. During the war numberless examples of painful scars, caused by gun-shot wounds, came into the hospitals for relief. It was in a case of this kind that I first saw morphine injected subcutaneously by the late Dr. J. Mason Warren. Mitchell refers to superficial shell wounds causing painful cicatrices due to compression of sensitive cutaneous nerves.

He was unable to find any accounts of the microscopical examination of painful scars, but is inclined to believe that some such alteration exists in the nerves as that described by Danielson and Broeck as occurring in anæsthetic leprosy. The early symptoms seemed to be referred to simple congestion of the neurilemma; the succeeding and latest phenomena are due to a hyperplasia of the connective tissues within and without the nerve sheath.

My attention has recently been called to a series of cases of wounds of the scalp followed by persistent headache in young persons. The pain was relieved in all cases by excision of the cicatrix, after other treatment had been tried without success.

The three cases here reported were referred to me for operation by Dr. C. F. Folsom.

CASE I.—C. H., student, aged seventeen. Family history excellent; general health good; was seen by me in October, 1890, with Drs. Folsom and Weir Mitchell. Four years previously he was struck in the head by a horse's hoof, which caused an ugly scalp wound. Was not unconscious. The wound was sewed up without special antiseptic precautions. A year later he began to have headaches, which increased in frequency and intensity until he was

<sup>1</sup> Injuries of Nerves. 1872.

virtually disabled. He could not study or play, and moved about slowly, as otherwise the pain became agonizing.

He appeared, in October, to be in excellent health ; there was no trouble with the eyes.

Near the upper and posterior portion of the left temporal bone there was an irregular cicatrix, tender on pressure, and a little over an inch long.

According to Dr. Folsom's report, the initial point of the paroxysm of pain was in the anterior left temporal region, and the focus of greatest pain and tenderness when the pain was at its height was near the cicatrix, that region being quite tender on pressure. On October 29, 1890, the cicatrix was excised and the bone beneath explored. Two indentations being found in the bone, a button was removed with a one-inch trephine. The dura was reddened and adherent to the adjacent bone. The wound healed by first intention. The greatest care was taken for a year, when the symptoms all disappeared. The patient has remained well since.

The following is Dr. Whitney's report on the bone and cicatrix :

"The bone showed a uniform increase of thickening from one side to the other, and a section showed this to be due entirely to an increase of the diploë, while the inner and outer tables remained constant and normal. On the surface were two slight linear depressions, which were found to penetrate hardly half way through the outer table. There was no change in the bone beneath. The piece of scalp showed a normal cutis beneath which was a dense layer of connective tissue, such as is found in old cicatrices. Lying in this were several relatively large nerve trunks, some of which appeared normal, while others seemed atrophied and associated with an increase of nuclei in the sheaths. The diagnosis would be : Diffuse hyperostosis of the skull ; slight interstitial neuritis."

The relief of pain in this case may be ascribed not only to the removal of scar pressure in the scalp, but to the removal of a source of irritation in the dura, which, as we know, is supplied by the fifth pair, and is an exceedingly sensitive structure.

The next two cases are, perhaps, more perfect examples for the relief to be obtained by the removal of a painful cicatrix.

CASE II.—F. R., eleven years old, of neurotic temperament, and with a nervous family history, was stunned by a fall in 1886, striking on a curbstone. A scalp wound was made over the right frontal region about one inch above the supra-orbital ridge. In 1888 he was thrown from a small cart over a stone fence, and was unconscious for some time. There was at this time a small scalp wound over the superior and posterior portion of the right temporal bone. In the same year, also, he was partially stunned by being thrown from a street car.

Two to three years after the second injury he began to have persistent slight headache, with paroxysms of severe headache. He also had frequent attacks of partial loss of consciousness, somewhat resembling *petit mal*.

An examination of the eyes gave a negative result. At the request of Drs. V. Y. Bodwitch and Folsom I operated upon him November 23, 1892, excising both cicatrices. The wounds healed by first intention. Relief from headache was gradual. But he has remained well in spite of a blow on each scar received since, with temporary return of headache. Dr. Whitney reports that "An examination of the scar tissue shows quite distinctly a comparatively large nerve fibre, the fibrillæ of which are more or less widely separated by fibrous tissue of the small cicatrix in which they are lying."

The accompanying plate (Fig. 1) shows the appearance of one of the nerves in this cicatrix. The nerve consists of embryonic nerve fibres, and there is considerable cell infiltration around the perineurium. The irregular arrangement of the bundles of connective tissue fibres is well shown. Those which have been divided transversely have been slightly displaced, and give a somewhat disorderly appearance to the centre of the cicatricial tissue.

CASE III.—Miss —, twenty years old, and of fairly good health, was living on a cattle ranch in 1884, when she was thrown and kicked in the upper and posterior portion of the right temporal bone by a well-shod horse, causing a large irregular scalp wound, which was filled with sand gravel. The wound healed by granulation. There were no cerebral symptoms at the time or later until 1888, when she was thrown from a horse twice, once being dragged about fifty feet. Severe and persistent headache began, becoming much worse at the



catamenial periods. There was also mental confusion. General treatment failing to relieve the headache, Dr. Folsom asked me to excise the scar. The operation was performed in March, 1892. No injury to the bone was found. The wound healed by first intention, and the relief from headache since has been complete.

A microscopical examination of the cicatrix showed that a nerve trunk of considerable size had been involved in the scar tissue. In Fig. 2 a transverse section of the nerve is shown in the deeper layers of the cicatrix. The sheath is thickened, and there is considerable cell infiltration in the neighborhood. We find in these cases not only the existence of pressure, but more or less extensive alterations in the nerve. In Case II the section shows a portion of a nerve which has been divided, but is already in an advanced stage of repair, and quite capable of transmitting painful sensations. Some of the specimens showed an interstitial neuritis, which is evidently the chief source of the pain.

Among the most common of the pathological changes observed in scars is that hypertrophic condition known as keloid ( $\chi\eta\lambda\eta$ , a claw).

There is a general tendency among writers at the present time to disregard the distinction between true and false keloid.

True keloid has been considered by most observers as a spontaneous new formation in the corium independent of any pre-existing wound, but there is a growing feeling of late years that keloid tumors spring from cicatrices more frequently than has been supposed, and that some cases of supposed true or spontaneous keloid in reality sprang from minute scars caused by pressure of clothing or friction of folds of skin. Kaposi recognizes both true and false keloid, and also a third variety, which he calls hypertrophied cicatrix. The latter form I have already described as a variety of scar. In addition to these forms a verrucose cicatricial tumor is described by Hawkins, and syphilitic keloid is mentioned by several writers.

The typical true keloid, like that described first by Alibert, is situated over the sternum, and is composed of newly-formed tissue of firm and elastic consistence, sharply defined and raised 2 to 4 mm. above the level of the skin. It extends trans-

versely across the median line of the chest and terminates at either end in one or more prolongations which give it its characteristic appearance and name. Its surface is smooth and shiny, and the color red, like that of a scar, in the single specimen which I have seen during life. It is, however, said at times to be white, pinkish, or even purple. It grows to a certain point and then remains stationary. There is little or no tendency to ulceration. There is usually no history of a pre-existing scar, and the growth to all appearances has developed spontaneously. Keloid is described by different authors as growing in almost any region of the body, but the pure type, such as I have just described, is found on the chest, and as it is an extremely rare form of growth and is highly characteristic in its appearance, it seems to me deserving of a separate classification from other forms of keloid, in spite of the possibility that it may have developed from some lesion that may have passed unnoticed. According to Hebra, it is found once in 2000 cases of skin disease. True keloid rarely disappears. I do not find any well-authenticated reports of the spontaneous disappearance of such a tumor. It is not painful, but may give rise to an itching, prickling sensation, and it is for this reason principally that patients are said to seek relief.

False keloid may develop in almost any part of the body. There appears to be a tendency in scars situated on the chest to form keloid tumors more frequently than elsewhere. Why this is the case is not apparent, but in this region hypertrophies of scars seem to be more frequent than elsewhere. False keloid is also found in the face, both surfaces of the extremities, back of the hand and foot, and external genitals (Crocker). It is found after puncture of the ears, and sometimes develops from leech bites. It is also well known to spring from the scars of acne pustules, and in this case is often multiple. Hutchinson gives a portrait of such a case, where in addition to numerous tumors in the back, there is a growth over the sternum strongly resembling true keloid, which suggested to him the possibility of the development of the latter variety from acne pustules, so frequent in this locality, which have been overlooked. They are said to be found rarely in the mucous membrane. Verneuil reports a case of keloid of the conjunctiva.

De Amicis describes the case of a woman, twenty-seven years of age, who had 318 tumors, and Hebra mentions a family, all the members of which were afflicted with multiple fibroid. Kaposi reports the case of a keloid the size of a fist in a negro who had numerous keloids.

Ziemssen reports the case of an individual who had 105 keloids.

True keloid appears to be a disease of adult life, but false keloid may appear at any age. There seems to be a keloid disposition in certain families and individuals, and the peculiarity of the African race in this respect is, of course, well recognized in this country. False keloid grows to a certain point and remains stationary for many years, and finally flattens somewhat and becomes paler. It may grow at times to an unusual size.

Hayes<sup>1</sup> reports one tumor of this kind weighing eighteen pounds. The patient was a black male, thirty-six years of age. Had first noticed the swelling sixteen years before. It was situated on a line with the eighth dorsal spine. It had begun to grow three years before, and at the time of its removal it covered the entire back. The photograph shows it to be of the papillary variety. It was examined by a pathologist at Johns Hopkins Hospital, who pronounced it a hard fibroma.

It is doubtful whether such a tumor as this should be called a keloid.

False keloid is particularly liable to grow in the scars from burns or caustics, or even blisters.

Hutchinson<sup>2</sup> reports the case of a negro who suffered from an extensive burn of the neck and chest caused by boiling water. The new growth hung like a leather collar over the left shoulder and chest. An interesting feature was observed in this case: The man had about him many other old scars on his arm from bleeding and on his back from cupping. There was also one on his forehead, the result of an injury received not long before the scalding. The cupping marks and those of bleeding were of various dates, but all of

<sup>1</sup> Alabama Med. and Surg. Age, 1891.

<sup>2</sup> Hutchinson's Clinical Illustrations, Pl. 88.

some years' duration. After the scar of the scald had taken on keloid, many of his other old scars began to indurate also; in some the induration was only slight, but in others it was very marked. This occurrence seemed to indicate to Mr. Hutchinson that in some way the keloid patch had shed infective material into the blood which had the power of developing only scar tissue. When seen two years later, the large patch of keloid had grown decidedly thinner and softer.

Microscopically, we find the tumor, both in true and false keloid, to be made up of bundles of fibres running horizontally some little distance beneath the surface of the corium, and arranged parallel to the long axis of the tumor. In old keloid the tissue is extremely dense, and the bundles of fibres are closely packed together. In one case of true keloid which I have examined, the upper third of the corium lay above the tumor, and also the papillæ with their normal covering of epidermis. This is supposed to be one of the distinguishing points between true and false keloid. As there has been no pre-existing scar in true keloid, the upper layers of the skin remain intact.<sup>1</sup>

In another case of true keloid, where the growth projected nearly one-fourth of an inch above the level of the skin, the papillæ had disappeared over the most prominent portion of the tumor. That the absence of the papillæ was probably due to pressure is suggested by the absence, also, of the upper layer of corium, which is usually seen above the keloid. The new formation appeared in this case to have pressed directly upon the papillary layer.

Babes and Winiwarter have also observed the absence of papillæ in true keloid, and attributed it to the same cause.

In the middle of the tumor we find bloodvessels running parallel to the fibres and surrounded by a thin layer of fusiform cells. These vessels can be traced into the bundles of fibres which project into the surrounding tissue. Tracing these vessels still further into the normal tissue, we find a cell growth in the adventitia for some distance beyond the periphery of the growth.

<sup>1</sup> Warren *uber* Keloid. Sitz b. d. k. Akad. Bd. LVII. Vienna, 1868.

In the case in which I was able to make these observations the changes in the adventitia were best seen in these vessels at each end of the growth beneath the papillæ. Here the walls of the arteries were surrounded by numerous cells, but the veins had no such growth about them.

Cross sections of another specimen of true keloid showed the longitudinal fibres to be separated into bundles by bands running sometimes obliquely upward. These are probably obliterated vessels (Langhans). Crocker examined a keloid of three weeks' standing only. Dilated bloodvessels surrounded by round cells were very numerous near the growth, and around the walls of the vessels of the tumor were found many flattened and fusiform cells.

In false keloid we see the same development of longitudinal fibres running parallel to one another, but above this growth is the cicatricial tissue, which can readily be distinguished from the keloid growth, as the fibres run in various directions. The papillæ are, of course, wanting. Vessels of considerable size run longitudinally through the growth, and their adventitia is occupied by vessels and spindle-shaped cells.

In both true and false keloid the glands of the skin are wanting, although the remains of these glands may be seen occasionally beneath the new formation.

This statement of the minute anatomy of keloid agrees essentially with that made by Langhans, Kaposi, Crocker, Plicque and others.

The development of keloid probably takes place in the following way: A growth of cells first occurs in the adventitia of the arterioles; these later become fusiform cells, and finally fibres. As bundles of fibres form in this way around the arteries, the tissue of the corium is gradually compressed by them, and the different bundles thus uniting form the keloid growth.

Keloid is a fibrous tumor, which in consequence of its development of the vessels, is composed of bundles of fibres running parallel with them in contrast to a simple cicatrix, which consists of fibres which form a network. The tendency to recurrence is evidently due to the implication of the walls of the bloodvessels for some distance beyond the borders of the tumor.

The origin of such a growth from the walls of the smaller arteries, and the presence of many fusiform cells, suggests the possibility of the existence of muscular tissue at some period in the existence of these growths. We have examples elsewhere of fibromyomata, and it is precisely in those races most liable to uterine fibroids that keloid is most frequently found. One authority, as we have already seen, has sought to explain in this way the great contractile power of this form of growth. A more careful study of the origin of keloid might develop the fact that the media of the artery is also involved in the pathological change, and that a growth of myomatous tissue actually does take place.

As an interesting commentary upon this theory I will cite the following case:

Kempf<sup>1</sup> reports the case of a young lady, nineteen years of age, with a spontaneous growth of about two years' standing on the right side of her face over the lower jaw, perfectly smooth and solid, accompanied by flashes of pain. The growth returned one year after removal, and small keloid tumors appeared where the sutures had been inserted. Hypodermic injections of Squibb's extract of ergot dissolved in alcohol were given two or three times a week. After several weeks of this treatment this tumor entirely disappeared.

Myoma of the skin occurs in the form of leiomyoma; that is, a tumor composed of unstriped muscular fibre. According to Winiwarter this form of growth may occur in connection with other tumors, such as sarcoma, keloid and angioma.

It is useless, of course, to speculate upon the cause of this active development of tissue in the skin. Whether the irritant which produces the growth is infective, or simply a defect in the regulation of the formative process, must for the present remain a matter of pure speculation.

I think it advisable to retain the classification of true and false keloid, although it is highly probable that the so-called true keloid develops from a minute scar or blister.

True keloid is nevertheless essentially an independent new formation—a tumor, in fact—and presents certain well-marked

<sup>1</sup> Louisville Medical News, October 12, 1878.



anatomical differences from false keloid, which is clearly a growth springing from and intimately associated with scar tissue.

The diagnosis of keloid is usually not difficult. It may, however, be mistaken for a non-ulcerated gumma, or even a tubercular affection of the skin, which is occasionally accompanied by a firm fibrous growth. Some forms of nævi have a cicatricial appearance. Lymphadenoma in its early stages may resemble keloid, and Virchow points out the sarcomatous nature of certain cases of supposed keloid, and it has been suggested that the frequent recurrence of some tumors of this kind are thus accounted for. Some forms of fibroma have evidently been mistaken for keloid, as, for example, the case of large fibroma of the back already mentioned.

Cancer has been associated with cicatrices by writers ever since Alibert described keloid, and pointed out the close affinity which the disease, which he first called cancroïds, was supposed to bear to epithelioma.

It requires only a brief glance through the literature of scars to find that it teems with examples of this form of degeneration.

It is said to occur most frequently in cicatrices which have been produced by cauterization or blistering, although Reid maintains that the nature of the previous injury does not influence the subsequent morbid changes. It appears usually long after the scar was originally acquired, and it is seen most frequently in individuals from forty-five to fifty years of age. Males are said to be more frequently afflicted than females. (Jauzion.) Cancer seems to develop in those scars which have been subjected to long periods of irritation. We find them, therefore, in cicatrices of the limbs which hamper their movements, and which consequently are constantly subjected to undue tension, or in the scars of ulcers, or wounds, or fistulæ.

The disease generally forms when the cicatrix has existed several years; its progress is slow; sometimes a cicatrix ulcerates and heals repeatedly before the ulcer assumes its peculiar character. (Reid.) In a list of twenty cases collected by Smith,

the longest period after the original lesion at which the disease appeared was sixty-one years, the shortest five years. In twelve instances the injury causing the scar was a cut or a laceration of the integuments, and in eight cases a burn or a scald. The affection appears to exhibit two principal forms: the first characterized by the development of one or more warty tumors which increase and spread by the addition of similar growths formed in the neighborhood. This is the so-called papillary form. The second is the ulcerating form, having either a coarsely granulated or fibrous aspect, and spreading by the development of cancerous tissue in the surrounding integument. Both of these types are supposed to have a low degree of malignancy. (Reid.)

Rudolf Volkmann<sup>1</sup> has collected 128 cases of cancer developing from scars, ulcers or fistulæ of the extremities: of these the greater portion formed in scars, particularly those which had a tendency to break down and ulcerate, or in wounds which for some reason had not entirely healed. As this is the history of most ulcers of the lower extremities it is not surprising to find that cancer occurred ninety-five times in the lower extremity, and only thirty-two times in the upper extremity: in other words, the disease is nearly three times as frequent in the lower extremity.

Next in frequency to the ulcerating cicatrix it was found that the secondary contractions following burns, in which the cicatricial tissue was sometimes as thin as paper, became the seat of cancer. But in these cases there was, without exception, a history of frequent breaking down of the scar with suppuration and subsequent healing. In some of the cases reported the cicatrix was due to frost-bite, gangrene, or contused wounds. The cicatrices of syphilis and lupus were also occasionally the seat of cancerous degeneration.

Cancer of the lower extremity developing in ulcers is of a mild type, usually resembling more closely the so-called epithelioma than any other form of carcinoma. Some of them have

<sup>1</sup> Klinische Vorträge, February, 1889.

large epithelial cells and belong to the polymorphous type of epithelioma, while others resemble closely the pure rodent ulcer, or small cell epithelioma, containing chiefly cells such as are found in the deep layers of the rete mucosum.<sup>1</sup> It is on this account that glandular involvement in these cases is comparatively rare. In the 128 cases quoted by Volkmann, only twelve were known to have died of cancer. Sixteen of these died of other diseases, and in fifty-five cases the subsequent history could not be obtained. In no case was a relapse reported later than two years after the operation. In only two cases was metastasis to the internal organs reported, death occurring chiefly from exhaustion. It was found by Volkmann that scars of the leg were the most frequent seat of cancer, and that those of the back of the hand came next in order of frequency.

Jauzion found that cancer developed most often in cicatrices from ulcers of the leg, and then in cases produced by burns, blisters, or cautery, lupus and psoriasis, in the order given. He found occasionally an inflammatory enlargement of the adjacent lymphatic glands, but it is extremely rare to find any infection of them with cancer.

Jauzion reports the case of a cancer developing in a scar produced by the application of a blister to the arm: the disease appeared two years later. A case of cancer in a female, sixty-one years of age, in a scar produced by cautery, employed in the treatment of eczema, the disease appearing six years later; amputation at shoulder with cure. In another case, in a male, fifty years of age, the disease was of eighteen years' duration, and had made its appearance in the scar twelve years after the application of cautery. In a case of an individual, forty-four years of age, cancer had appeared in the cicatrix formed after the cure of tuberculosis of the elbow joint.

Bradley reports a case of cancer developing in a cicatrix of the face where the corner of the mouth was drawn down as if by the scar of a burn.

The following cases which came recently under my observation are good examples of this affection :

<sup>1</sup> Warren, Rodent ulcer, 1872.

H. G., sixty years old. Thirty years ago was badly burned in the back of both legs. The wound of the left leg had never completely healed, small ulcerations developing repeatedly. Six months ago a large ulcer formed in the cicatrix of this extremity behind the internal condyle of the femur, and has continued to increase in size. On examination, extensive cicatrices were found behind both knees. The left leg was flexed on the thigh at an angle of 45 degrees by the contraction of the scar, which was 4 inches broad and extended from the middle of the thigh to just below the middle of the leg. A fungous mass occupied the seat of the ulcer, which was 3 inches long and  $1\frac{1}{2}$  inches wide, and had an indurated base. As the patient refused amputation the ulcer was excised, and on examination by Dr. W. F. Whitney it was pronounced to be epidermoid cancer. At the time of her discharge from the hospital a glandular enlargement in the groin was noticed.

T. C., forty-seven years of age, came to the hospital with ulcers on both legs. That on the right was about the size of a silver dollar. On the left leg an extensive ulcer, size of the palm of the hand, existed, involving a portion of the tibia. The surface of the ulcer had a peculiar furry appearance, which formed a brownish scab when allowed to dry, but which could not be removed by poultices.

This ulcer first appeared when he was nine years of age, and that on right shin appeared when he was fourteen years old. Both ulcers had healed and reopened at different times. Had syphilis eight years ago, and scars of old specific ulceration were found at various points. The glands in the groin were not involved. As the patient refused amputation the ulcer was scraped and cauterized. The microscopical examination showed the growth to be epidermoid cancer. As the disease promptly returned the patient finally allowed amputation. Dr. Whitney made the following report on the specimen:

"On the inner side of left leg an ulcer measuring 12 cm. by 7 cm., commencing just above the malleolus, covered with dirty black crusts; bone exposed in centre; section showed the edges thickened with a narrow zone of an opaque white growth. At the upper part of this a new growth was found extending for some distance into the bone, and small centres of disease were found in the spongy bone. Under the microscope appeared large flat epithelial cells. Disease restricted to narrow zone about the edge of the ulcer, and its largest masses were to be found in the bone itself."

The ulcer in the right leg healed promptly with rest in bed.

W. H., forty-seven years of age, consulted me in regard to a scar on his arm near the insertion of the deltoid, which had been giving him trouble for over ten years. "The mole," as he called it, had existed since childhood. On examination a reddened hypertrophied scar was seen about two inches long and one inch wide. Several deep ulcerations existed. The patient postponed operation for nearly a year, during which time no appreciable change took place. On removal of the tumor the ulceration was found to be due to an epithelial growth in the scar tissue. It is now eighteen months since the operation, and there has been no sign of a return. The patient has had syphilis for about three years.

I have had an extensive experience with cancer of the face, but do not remember to have seen the development of many cancers from a distinctly cicatricial tissue.

One of the most typical cases of "*Noli me tangere*" that I ever saw developed from the cicatrix of a gun-shot injury. The whole side of the face, including the ear, eye, cheek and side of nose, had been eaten away. The disease had lasted nearly thirty years, when the patient died.

It is said, however, to form in lupous ulceration, and in the scars of lupus (*Winiwarter*), and it is therefore highly probable that a certain portion of cancers in this region find their origin in cicatricial tissue. *Heurtaux* reports the case of a man, forty years of age, who fell into the fire when he was two months old. He had all his life an extensive scar of the face on the left side. Four years previously it had begun to ulcerate, and at the time of operation there was an ulcer 10 cm. by 8 cm. involving the greater part of the temple and cheek. It was dissected out and found to be superficial. On microscopical examination it was found to be an epithelioma ("*lobulé*").

Sarcoma may also develop primarily from scars, as shown by *Winiwarter*, but I do not remember to have seen an example, nor have I happened to have found a reported case. Many of the so-called keloid tumors of unusual size are undoubtedly sarcomatous in nature, and *Virchow*, as we have seen, attributes the recurrence of such growths to their malignant character.

Taylor reports the case of a sarcoma resembling a keloid. The photograph shows an elongated and irregular shaped keloid growth from which protuberances spring at different points. The history is that of a case of spindle cell sarcoma developing from a wart.

Jacobson<sup>1</sup> reports a case of sarcoma keloidoforme. The patient, a healthy man twenty-seven years old, had on each shoulder a keloid-like tumor. One appeared to form spontaneously and to have the appearance of a true keloid. The other sprang from the scar of an acne pustule, and appeared to be a false keloid. Both tumors, however, proved to be spindle-cell sarcomas. The former had existed three years, the latter five years. After operation the patient was lost sight of.

Calcareous degeneration of a cicatrix is reported by Tunis.<sup>2</sup>

The case was that of a female, thirty-nine years of age. When a child she had sustained a severe burn on the thigh and back. An extensive scar had formed in consequence, and in the centre of this cicatricial tissue an ulcer had formed which was situated over the great trochanter of the right femur. The edges of the ulcer were very hard and leathery, enclosing an area the size of a dollar. A large piece of yellowish white material resembling bone was adherent to the base of the ulcer. The fragment of calcareous material was connected with a stratum of similar substance which stretched down into the deeper parts of the cicatrix. The mass was removed, and the wound was closed by a very extensive plastic operation, and no tendency to a return of the calcification was noticed three months later.

It seemed to the author that this degeneration had been produced by the deficient blood supply brought about by the contraction and pressure of the cicatricial tissues in the blood-vessels. In this case the cicatrix was so extensive that the central portion might have been so feebly vascular as to have been easily deprived entirely of blood.

A more common form of complication in the life history of

<sup>1</sup> *Archiv. für klin. Chir.*, Vol. XXX, 1884.

<sup>2</sup> *J. P. Tunis, Univ. Med. Mag., Phila.*, 1892-93, Vol. CXXII.



scars is suppuration. These cases occur so frequently that there is but little excuse for reporting them. Perhaps the most frequent examples of suppuration are found in scars connected with bone. The reopening of the cicatrix, and the formation of an ulcer or sinus, suggest strongly the recurrence of disease in the bone, but this is by no means always the case. The cause of the suppurative inflammation may be due either to re-infection of the cicatrix, or to the awakening of spores which have long been dormant. The most common form of relapse is due to tuberculosis. An unfavorable state of the health or a severe local strain are usually the exciting causes.

A cachectic servant girl applied for relief from repeated re-opening of cicatrices about an ankylosed hip joint. The thigh was flexed to nearly a right angle. The limb was straightened by osteotomy, and the patient, who was seen several years after, had had no return of the suppuration in the numerous cicatrices about the joint. There had been no disease in the bone since the ankylosis.

A lady, sixty-five years of age, with a history of tuberculosis of the ribs, was operated upon for tuberculosis of the sheaths of the peroneal tendon. An incision, six inches in length, with its angle at the external malleolus, enabled me to dissect off the tubercular mass from the tendon. The wound healed readily at the ends, but a sinus remained at the angle of the wound for several months. This healed rapidly as soon as the joint was placed in a plaster splint. Two years later the wound re-opened at this point after the patient had regained her activity, and a second operation was necessary for the removal of a tuberculous deposit. With fixation of the joint, the wound healed in three weeks. The patient's health during the interval had been excellent.

Cicatrices may re-open, owing to the presence of foreign substances within them.

The use of silk ligatures and buried sutures is now a well-recognized source of the formation of obstinate sinuses. This is true, however, of certain localities only. How often do we hear from silk ligatures used in an amputation of the breast after the wound has once healed?

On the other hand, operations in the abdominal walls or

cavity are often followed by the development of stitch sinus, even though the wound has healed in the most approved aseptic manner. The size of the ligature used in pedicles accounts partly for this difference, but the principal cause is the strain brought to bear upon the cicatrix. The formation of minute stitch abscesses and sinuses in operations for the radical cure of hernia and the shortening of the sound ligaments are familiar examples of this type. Even though the buried suture be thoroughly aseptic, the subsequent strain brought to bear upon the tissues paves the way for a secondary infection.

Abscesses are occasionally reported in keloid growths. Richon<sup>1</sup> mentions the formation of an abscess in the thick tissue of keloid of four years' standing in the lumbar region. The growth was removed and had not returned eighteen months later. An histological examination confirmed the diagnosis of keloid with a central cyst, which contained a lining of endothelium. The cystic character of the cavity may be accounted for by the slow formation of the abscess.

Cicatricial tissue does not appear to suffer any senile changes, which in other tissues has been quaintly characterized by Hutchinson as "Tissue Dotage." By this expression he refers to the power of the senile skin to develop papillomata, freckles and malignant growths, also nævi and hypertrophies of the sebaceous glands. Beyond the distinctly diminished resisting power to carcinoma, there appears to be no degenerative process clearly due to age. In fact, the scar tissue may be said to have grown old prematurely, and, therefore, is susceptible to no further change with advancing years.

A study of the cicatrix which forms between the Thiersch grafts and the subjacent tissue may not be out of place in a paper of this kind.

According to Garré,<sup>2</sup> a layer of exudation material forms in most cases between the graft and the tissues, and glues the surfaces together. This varies greatly in thickness. At first it consists principally of blood clot; cells wander in later, and

<sup>1</sup> Bulletins et Memoires de la Societe de Chirurgie, 1882. Vol. VIII, p. 440.

<sup>2</sup> Beitr. zur klin. Chir., 188-9, IV, 625.

granulation tissue is formed from which the cicatrix is developed. The conditions vary somewhat according to the nature of the tissue on which the graft is placed. The exudation is most abundant when the basis is formed by the cutis or subcutaneous tissues; less so when the deep fibrous layer of granulation tissue or adipose tissue or fascial tissue is used as a base. The exudation is very abundant, however, when muscular tissue forms the bed of the graft.

Grafting can be successfully done on spongy bone, but not on cortical bone.

Most of the vessels of the graft become atrophied. In a few cases the blood is found circulating through their lumen in a few days. The blood supply is, however, furnished chiefly by new vessels. Some of the new vessels grow directly into the old vessels of the graft.

As new cells are formed, after the horny layer of epidermis has been thrown off, the deep cells of the rete begin to multiply and a new epidermis is developed. When the rete mucosum comes in direct contact with the tissues, the cells begin to grow more rapidly.

The layer of granulation tissue forms more rapidly when there has been little or no effusion of blood.

In old ulcers of the leg the grafts are apt to break down with use. This is due to great liability to extravasation of blood in the cicatricial scar tissue, which seems to have a feeble power of resistance. The stasis which this causes interferes with the growth of the epidermal cells, and this layer peels off from its bed in numerous places.

*Treatment of Scars.*—Every effort should be made to favor as minute a development of scar tissue as possible. The careful adjustment of the edges of a wound is too well recognized an axiom to need repetition here. If buried sutures are to be used, I should strongly advise the use of an animal suture rather than silk, owing to the tendency of the latter substance to work its way sooner or later to the surface at some point. Any one who has studied under the microscope the healing of wounds cannot fail to recognize the great irregularity of the edges of the wound

and the tendency of the epidermis of one lip to bury itself uselessly into the deeper tissues. An unnecessary amount of granulation tissue is formed in such cases, and furnishes material for an hypertrophied cicatrix (a new formation between the edges of the wound). Very superficial stitches should be used more freely than in my experience is customary with surgeons. Packard recommends the making of very oblique superficial incisions, which in his experience leave an imperceptible cicatrix. Such an incision gives to the margin of the skin conditions similar to that which obtain in the Thiersch graft, and theoretically ought to bring the cicatrix, as we have already seen, beneath the surface. The danger of bruising such a tender structure might frequently stand in the way of a satisfactory result.

Lassar<sup>1</sup> claims that disfiguring scars may be avoided when there is a considerable loss of substance if we recognize the fact that the human skin has a greater power of regeneration than has usually been assigned to it. The popular idea that the flesh of certain people heals quickly is not a fanciful one, but is based upon an unusual power of regeneration in the skin which they possess.

When there is a large open wound on the face, the skin forming the edges of the wound pushes forward until the exuberant granulations are reached. From this point a thin layer of epithelial cells grows over the granulation tissue and forms a scar which remains as a permanent disfigurement. This stage of the healing process should, according to Lassar, be prevented, and for this purpose the dressing should be removed every few days and the thin layer of epithelium should be scraped off. The borders of the skin may be refreshed by a knife or a sharp spoon. In this way the normal epidermis and corium will have an opportunity to cover in a much greater surface of the wound, and the cicatrix will often be reduced to an almost imperceptible size. Volkmann has called attention to the fact that those parts of the face in which the skin contains large hair follicles and sebaceous glands have an unusual power of regeneration, as these structures are storehouses of epithelium from which a mass of epider-

<sup>1</sup> Berliner klinische Wochenschrift, 1887, No. 37.

mis is formed which springs up through the granulation tissue and is surrounded by the superficial growth, giving to the newly-formed skin both the functions and appearance of an almost normal structure. It is perhaps due to the greater regeneration of the skin of the face that scars in this region are less liable to stretch.

Robert Jones has also dwelt upon the importance of a systematic checking of the superabundant growth of granulations, as the contractility of cicatrices is largely dependent upon the amount of granulation tissue which becomes organized. He advises that the granulation should be frequently scraped and burned, while the limb (in case the scar is there) should be kept extended. Plastic operations should not be performed for the relief of contractions until the old cicatrices have been stretched. The healthy skin is stretched at the same time, and the contractile element in the scar tissue is destroyed by continued extension. It is this yielding of cicatricial tissue which favors hernia in abdominal scars.

It is important to remember that the skin, and, indeed, other tissue, as muscular fibre or aponeurosis, are capable of regeneration, and that by approximation we favor this process and avoid, as much as possible, the substitution of the less highly-organized cicatricial tissue. I do not believe it to be a good substitute for other tissue in the radical cure of hernia. "Scar tissue is unreliable and should be avoided," ought to become an axiom of modern surgery.

For projecting scars compression has been recommended by various authors. Panas<sup>1</sup> quotes the case of an actress who had scars on her face from smallpox. She wore for the space of six months a mask both day and night. The skin, at the end of the treatment, presented to the feel a polished surface; but when pinched up, points of induration could be felt in it. Compression will often remove the redness as well as the elevation of a scar. The earlier it is done the better. It should be continued for some time after the nodule has disappeared. It must be used at first all night; later on in the treatment, compression for a

<sup>1</sup> Paris, 1863.

few hours at a time will be sufficient. For old scars he advises excision; slight scars can often be removed by actual cautery.

Unna<sup>1</sup> recommends for the treatment of depressed scars of the face friction with sand to prevent the undue accumulation of the horny layer of the epidermis. A case of scars produced by pustular acne was treated successfully in this way. After a few months of this treatment it was found that the depressed scars on the nose were shallower and smaller in diameter, and were scarcely perceptible. In a case of smallpox scarring, in a woman twenty years of age, three months of the friction treatment made the skin smooth. The situation of the previous depressions was marked by less pigmented circular spots.

Unna employs finely powdered marble. He prepares a "pulvis cutifricius" of two kinds. The powder may be used alone or mixed with powdered soap, sulphur or other powders. It should be applied as a lather. The action of the carbonate of lime has probably some beneficial effect. A fine sponge is dipped in the powder and the diseased parts are polished with it, at first slowly, later more rapidly but lightly, more as one would polish a boot. The frictions should be employed for ten to fifteen minutes once or twice a day.

Depressed cicatrices from gunshot injury, disease of the bone or of the glandular structures of the neck are often the cause of considerable deformity. An operation for their relief has been planned and successfully carried out by William Adams.<sup>2</sup> This consists in the subcutaneous division of the scar with a fine tenotomy knife. Two or three punctures may be necessary to liberate extensive scars. The cicatrix should then be carefully everted, and while held in that position two hair-lip pins or finer needles are passed through its base at right angles to one another so as to maintain the cicatrix in its everted or raised form for three days. Adams reports several cases in which the depression had not reappeared several years after the operation.

Pigmentation of the cicatrix may be due to various causes. That produced by the presence of particles of powder is most con-

<sup>1</sup> Unna, *Vierteljahr. für Derm. and Syph.*, Vol. VIII, p. 508.

<sup>2</sup> London, J. and A. Churchill, 1879.



spicuous. These cases should be taken as soon after the injury as possible, and the skin should be scrubbed with a nail brush while the patient is under ether. A number of cases have been most successfully treated in this way by C. B. Porter. In older scars the particles of powder can be removed without further deformity by the punch devised by S. J. Mixter for that purpose.

Unpigmented scars are said by Pashkis to be improved by tattooing with a skin-colored mixture made with sulphate of baryta, yellow ochre and water.

The treatment of true keloid is most discouraging, owing to the persistency with which it returns. The patient usually seeks relief from pain and itching rather than from the deformity. Kaposi recommends the use of mercurial ointment alone or in combination with iodine and glycerine. Quinine and arsenic may be given internally.

Plicque recommends scarification for the relief of pain. The incisions should be made about 1 cm. apart and should cut through the whole thickness of the tumor.

If excision is attempted, the line of the incision should run from 1 to 2 cm. beyond the limits of the disease, and should extend through the cellular tissue to the muscular aponeurosis.

In certain regions it is possible to remove the growth with an ample margin of healthy tissue, as in the lobes of the ears. In such cases recurrence rarely takes place.

I have recently had an opportunity of seeing a young woman on whom I operated six years ago for recurrent keloid of both ears. On one side there was a double tumor, *i. e.*, a growth on each aspect of the lobe; on the other side a single tumor. The ears were bored at the age of fifteen, and the keloid began to develop in a few months. The tumors were removed three years before they were operated upon by me. My operation consisted in excising a large portion of each lobe by a V-shaped incision. There is at present a small, but well-shaped, lobe on each ear, without an appreciable scar.

Compression is recommended by many writers for the cure of false keloid. Unna treated in this way a cicatricial keloid, the result of a burn. A soft mercurial ointment was first applied

and held with circular strips of adhesive plaster. Outside of this dressing collodion was used freely. The dressing was renewed at the end of a week. The keloid gradually disappeared after treatment during two and one-half months.

Iodide of lead ointment was occasionally used instead of the mercurial ointment. A mixture of four parts of acetate of lead with twenty parts of collodion is applied with a brush, and after a few days' treatment the keloid is said to shrink, become paler and cease to pain. The frequency of the application should be gradually diminished.

Compression has been employed by Verneuil by means of an elastic bandage. Vidal has produced great improvement, and even disappearance of the tumor, by deep linear incisions dividing the vessels thoroughly.

As keloid is a connective tissue structure it is possible that an inoculation with the virus of erysipelas might produce absorption of the redundant tissue. Whether such a powerful remedy would be justifiable in a case of non-malignant disease is doubtful. Volkmann reports a case of cicatricial keloid cured by an attack of erysipelas.

A girl nineteen years of age received, three years before, a scald from boiling water on the dorsum of the foot. The wound healed slowly, and three false keloids finally developed. The largest of the three was the size of a Borsdorfer apple. The other two were as thick as the finger, and one of stony hardness. The large tumor was removed, but the parents declined to allow the other two to be excised. Two days after the operation erysipelas broke out and lasted a week. The remaining tumors became gradually softer, and finally were absorbed, and in a few weeks no trace of them could be found. The seat of the tumors was, in fact, somewhat lower than that of the surrounding skin. The tumor which was removed proved, on microscopical examination, to be a typical keloid.<sup>1</sup>

Thiersch grafting may be employed with advantage to broad and flat cicatricial keloids. My experience in this method has been limited to one case, but is suggestive. The patient, a negro

<sup>1</sup> *Deutsche Chirurgie*, Lief. 5, p. 193.

about twenty-five years of age, had sustained extensive burns about the chin, cheeks and ears, which were covered with enormously hypertrophied keloid tumors. Several plastic operations were performed by Dr. M. H. Richardson, with great success, upon the mouth, which had been nearly closed by the cicatricial contraction. Finally, a large keloid mass was dissected off the chin, and when the base of the wound had granulated Thiersch grafts were applied. A careful observation of this case for several months since this operation shows that thus far the keloid tumor has not returned, although the tissue beneath the grafts is much indurated. The patient has undergone so many operations that he is waiting to regain strength and to watch the result of the grafting experiment before submitting to any further operation for the relief of the tumors which remain. The subject of grafting opens up a fruitful field of research in connection with the surgical treatment of cicatrices, but the limits of this paper do not permit of more than a passing allusion to it.

## SURGICAL TREATMENT OF CERVICAL, THORACIC AND ABDOMINAL ANEURISM.<sup>1</sup>

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AS I have interpreted the request of your committee, the task assigned has appeared to me to be rather the discussion of the principles applicable in practice to the treatment of aneurismal disease in the regions concerned, and the presentation of a series of propositions for your discussion, rather than a mass of statistics. The statistical method is especially inapplicable when discussing the treatment of aneurism, because cases presenting the most diverse conditions have been treated by the same methods. Cases where cure could reasonably have been expected, and others where avowedly but temporary benefit, or "euthanasia," was aimed at, have been subjected to the same treatment and grouped together in the same tables, so that the percentages of recovery, failure or death are useless as guides to treatment. Just so soon as we have accurately determined what is the best method theoretically for each condition—mark, not variety of aneurism, as classed in the books—and in practice correctly appreciate the conditions present, will our treatment meet with its proper measure of success; but statistics, as at present constituted, cannot decide these questions. The primary object in all cases must be to prevent further enlargement of the sac, and by such means as shall not in themselves prevent nature's efforts to cure. Whatever will relieve intra-saccular tension or diminish the direct momentum of the blood, will be advantageous. The moment either of these are done, the normal

<sup>1</sup> Read before the American Surgical Association, May, 1893.

resiliency of the sac and the surrounding tissues tends to diminish the size of the aneurism. If, at the same time, an actual pad be supplied by the gradual deposition of a material which can actively contract, one which, if left under proper conditions for a sufficient length of time, will actually become organized into connective tissue obliterating the aneurism, we have achieved all that art theoretically need do. If permanent closure of the section of artery from which the aneurism springs can also be secured, the ideal has been attained, rendering relapse impossible.

A recapitulation of the chief points of importance concerning the formation of thrombi in the living vessels will render easier of comprehension the rationalé of certain surgical methods commonly employed in the treatment of aneurisms. Not only the physical conditions of the blood and sac, but also the vital conditions of the sac wall and of the sac contents, mutually contribute to, or interfere with, the deposition of white thrombi. Absolute or, preferably, partial physical rest of the blood favors thrombosis. These conditions can be secured by complete or partial arrest of the direct blood-current flowing through or by the sac: (1) By lessening the force and frequency of the heart's action; (2) by dilatation of the peripheral capillaries, *i.e.*, reducing blood pressure; (3) by physical interruption of direct access of blood to the sac by proximal pressure or ligation; (4) by preventing the blood passing freely out of the sac by distal mechanical obstruction of the artery. All that is effected by proximal arrest of circulation is a temporary absolute quietude of blood in the sac; with later—from establishment of the collateral circulation—only that marked diminution in velocity of the current which is most favorable, as will shortly be explained, to the formation of a thrombus. Experiments have proven that after damage of the vascular walls moderate slowing of the blood favors the accumulation of white blood cells in the plasmatic current, but that a more marked diminution in the velocity is required to allow the blood plaques to gather in numbers in this peripheral layer, while at the same time the leucocytes relatively diminish. The plaques promptly heap up at the site of injury, according to Eberth and Schim-

melbusch, owing to their rapidly undergoing "viscous metamorphosis." The primary cause of the formation of white thrombi is this accumulation of blood plaques, resulting from slowing or irregularities of current and "viscous change," induced by contact with the intima, damaged by disease or traumatism; or by the presence of foreign substances. The next step is a rapid accumulation of white cells, fibrin ferment is set free and fibrin is formed, so that the completed thrombus contains "plates, leucocytes, fibrin and included red corpuscles." It is then clear that permanent human white thrombi probably require the conjunction of marked diminution of velocity of the blood with an alteration of the vessel or sac walls, to determine the primary accumulation of blood plaques.

The structure of white thrombi, owing to their gradual formation, peculiarly fits them to undergo those subsequent changes which are necessary for their conversion into permanent tissue, and goes far toward justifying the name "active clot," given to them in the past. But is the deposition of laminated white thrombi, however disposed in an aneurism, always advantageous? do their presence by their roborant action delay the fatal issue in proportion to their amount, even if no cure can be effected? Decidedly not theoretically, and clinically numerous instances could be quoted in support of this statement. If all portions of the sac are *lined* with clot, which remains in close contact with the wall, unquestionably its resistance will be increased, but if any part of the wall is not coated with clot, the hydrostatic pressure will not be diminished upon that point, and even if not previously weaker than other portions of the sac, yet if the direct blood stream impinged originally upon it, or is now diverted to it, the deposition of clot in other portions of the aneurism will then be absolutely harmful, hastening the yielding at that point; again, if the clot does not remain in absolute contact with the wall of the aneurism, hydrostatic pressure must still continue to operate harmfully. If, on the contrary, the clot diverts the blood current from the weaker to the stronger portions of the sac, or splits up the direct momentum, as it were, by breaking the one stream into many, although no true widespread rein-



forcing of the sac by layers of fibrin can be demonstrated, the strain is actually so lessened that the same end is attained, *i.e.*, lessened distension occurs, and by the same means eddies and still bays are often produced, which favor the commencement of a white thrombosis, *if the wall be in a fit condition to induce the accumulation of blood plaques*. Thus, theoretically, any obstruction effected by a thrombus which favorably diverts the direct blood-momentum from the weaker to the stronger portions of the sac, and splits up the current, will tend to produce a cure, even if the fibrin does not line the interior of the sac, but at the outset is irregularly disposed. This fact is not merely of theoretical interest, but often explains the clinical fact that means utterly inadequate to cause a primary deposit of clot over the entire surface of the sac, and, indeed, of *themselves* to produce any bulk of thrombus, yet initiate conditions which promptly go on to complete consolidation of the aneurism. In other instances large amounts of clot are formed, yet rupture of the sac, instead of being retarded, is unquestionably hastened. The prime difficulty at present resides in the uncertainty experienced in applying these facts in practice.

Considering the question of treatment the first point to be decided is, "What is meant by the word cure?" Let us examine the conditions found in cases alleged to have been cured. In some, the sac contains much clot, varying in amount from partial or complete lining of its inner surface with a thin or thick layer up to entire obliteration of all cavity; the thrombus may or may not be in close contact with the wall of the aneurism, but whatever its relation may be, it is not structurally continuous with the wall, and is not itself converted into connective tissue. At any time blood may insinuate itself between the thrombus and the sac, terminating in a relapse. Can such a condition be considered a true cure, especially in view of the fact that relapses long after apparent cure do thus occur? While such a condition often does lead to genuine cure, it frequently does not so result, and except in one of the conditions mentioned, *viz.*, entire filling of the sac with clot, can only act as a temporary barrier against further enlargement, unless the throm-

bus undergoes secondary changes presently to be described. It is vain to contend that filling the sac with firm coagula is potentially a cure, if relapses can and do occur, for we are not studying how to effect a temporary arrest in growth of aneurisms, but their *cure*. Examination of other specimens will show that the thrombi remain either partly, or throughout their whole extent, adherent to the lining membrane of the aneurism. At these points, or surfaces of contact, plasma cells penetrate the thrombus, probably passing along routes previously channeled out by invading white cells, if recent observations on experimental thrombi in bloodvessels are to be relied on. Still later, the thrombus will be found to have been replaced by a mass of cells—not leucocytes—which, becoming vascularized, and developing into connective tissue, shrinks, until a mere nodule of fibrous tissue remains, and a *real* cure is effected. This result is all the more prompt and certain if the sac-thrombus so extends as to occlude the mouth of the aneurism, and the artery above and below, because the blood *cannot* insinuate itself between the sac and the clot, which separation would at once arrest the process of organization just outlined. The failure of this obliteration of the artery in the immediate neighborhood of the mouth of the sac explains the temporary benefit which so often is all that results after apparent complete consolidation of an aneurism, because the blood separates the thrombus from the sac; if the blood thus introduced coagulates, organization can now be effected, provided no further disturbances occur, and this secondary thrombosis can sometimes be recognized post-mortem.

The absolute certainty with which a clot which has caused the cessation of all the physical evidences of aneurism—except the tumor—will become disintegrated, with return of all the symptoms, unless it is allowed to remain in close contact with the sac, must be strongly insisted upon. The possibility of temporary thrombosis, separation of the clot from the sac, and secondary clotting with final organization must not be forgotten, as has just been pointed out. It is then manifest why soft, red thrombi are less desirable than white, laminated ones, not only because they are not physically so stable, but because they must

contract, thus either wholly or partially ceasing to remain in contact with the aneurismal wall. For this reason they are incapable of penetration by organizable cells. Such methods of cure are both theoretically and clinically the best which most fully combine the following requisites, viz., such a marked slowing of the circulation, or breaking up of its direct momentum, that first plaques can collect on some diseased or damaged portion of the lining of the sac, then white cells can accumulate—so that fibrin may form—and that such conditions shall exist as will allow of no mechanical disturbance of the absolute contact of thrombus and sac wall. The necessary change of the interior surface of the aneurism, which under favorable circumstances initiates white thrombosis is, probably, very often effected by the vascular disease productive of the aneurism; but may not the failures so frequently met with, of inducing the formation of white thrombi in aneurisms, be due to the insufficient extent and nature of this change, since “not every part of the internal wall of the vessel” was “covered with a thrombus” in Welch’s experiments, “but such parts, even when severely lacerated,” may be “entirely free from thrombi?”<sup>1</sup> Each successful method does not combine in the highest degree all the essentials described as requisite. Let us analyze the various methods of treatment in vogue, in order to ascertain upon what their success depends. Proximal arrest of the circulation promptly lessens the local blood pressure, and relieves all the direct momentum of the blood, and often allows, after the establishment of the collateral circulation, of just the proper rate of blood flow through the sac to favor accumulation of plaques and all the other processes requisite to the formation of a white thrombus. This method rarely permits of disturbance of the relations between the clot and sac, but when failure results it comes from mechanical disturbances of the thrombus, because of the establishment of an unusually free collateral circulation, and, probably, also from the coincident lack of such an alteration of the sac-lining that the initiatory steps toward the formation of white thrombi can occur. My colleague, Professor Lom-

<sup>1</sup> The Structure of White Thrombi, W. W. Welch, M.D., p. 18, Reprint from Transactions of the Pathological Society of Philadelphia, Vol. XIII, 1887.

bard, has suggested that after ligation interference with the vaso-motor and blood supply to the sac from constriction of the vaso-vatorum, may account for some of the failures, because of nutritive alterations in the sac-wall.

How does distal arrest of the circulation act? The effect of the direct momentum of the blood is diminished, but in a less efficient manner than by proximal arrest; distal arrest does not directly lead to the formation of white thrombi,<sup>1</sup> but may do so secondarily by creating eddies and still bays by the mechanical effects of soft coagula; moreover, the contact of thrombus and wall is more apt to be disturbed. Unless the sacculation is unusually favorably located, distal ligation for innominate and aortic aneurism will usually only temporarily arrest the disease, but cannot produce what I have laid down as a genuine cure. Are there no other means but proximal or distal arrest of circulation whereby the same mechanico-pathological conditions can be secured? Certainly; if in any way the direct momentum of the blood current can be mechanically broken up into minor currents, eddies and relatively quiet embayed collections of blood will result which, if the other chief requisite be present, *i. e.*, change of the sac wall, will give rise to white clot formation; these thrombi, if maintained in contact with the altered sac wall, can now go on to organization. This mechanical action on the blood current seems to me the far most reasonable explanation of the good effect produced by the introduction of catgut, coiled wire and electrolytic needles into the aneurism, which can only determine *at first* the formation of red thrombi. When no further changes occur after such therapeutic efforts, either no perceptible effect is produced, possibly rupture of the sac is hastened, or only temporary benefit results until the soft clot disappears. The absence of sufficiently extensive alteration of the lining of the sac explains why these methods, including acupuncture, so commonly fail, and why Macewen's "needling" has been followed by the surprising measure of success which has been reported. This is because the latter plan is a combination of interference with, and

<sup>1</sup> This is no doubt partly due to interference with the free access of blood plaques.

partial splitting up of the direct momentum of the blood, with such a preparation of the interior surface of the sac as certainly induces accumulation of blood plaques, followed by the formation of that relatively immovable white thrombus most capable of going on to organization. The necessity for extensive irritation and consequent plastic infiltration of the lining coat of the aneurism is proved by the observations of Macewen, that but little thrombus forms around the needle punctures, but does upon all those portions of the sac where the needle has continuously scratched for many hours, *i. e.*, has inflicted such a kind and extent of injury as will insure a plastic inflammation of the sac-wall. Again, it must be remembered that this process is repeated until it is believed that all accessible portions of the sac have undergone change; that by this means those weak spots of the wall which are about to yield can be reinforced first, something of which no other plan of treatment holds out any certainty. Still further, the residence of needles from  $\frac{1}{2}$  to  $1\frac{1}{2}$  mm. in circumference, for periods of even so long as forty-eight hours, must exert a very decided effect upon the blood momentum and current, an effect the extent of which I hardly think can be appreciated unless actually demonstrated by experiment.

To recapitulate somewhat, Macewen's "needling" should supersede the introduction of catgut, wire, etc., because this method does not give rise to the formation of soft, red thrombi; it does cause the deposition of white thrombi, which will remain in contact with a lining membrane prepared to induce organizations of the clot; the clot can be deposited upon the weakest portions of the sac-wall, and eventually upon all accessible portions, not in a haphazard manner, which as I have explained, often serves to precipitate the fatal issue; the cure, if accomplished at all, must fulfill the conditions laid down as requisite for a true cure; by careful exploration of the sac with the needles, information can be obtained permitting of the needles being so placed as to divert the direct momentum of the blood from the weakest portions of the sac, for from a few hours to even forty-eight hours, and that, too, while a thrombus is forming at these weakened spots.

In conclusion, permit me to submit for your discussion the following propositions, which the present state of our knowledge relating to aneurisms seems to warrant. Future clinical results can alone determine whether I have correctly indicated them.

May I ask the Fellows to first discuss each proposition separately, according to each only the weight its importance deserves, rather than to consider them together, which can only lead to confusion.

#### THE TREATMENT OF CERVICAL ANEURISMS.

(1) All methods should be supplemented by recumbency and diet.

(2) Proximal compression, when feasible, should always be tried, and where the arterial coats are seriously diseased should supersede ligation.

(3) "Needling" should supplement pressure when the case is progressing rapidly; possibly it is advisable in all cases suitable for compression, and is certainly to be employed where this method fails in cases with highly atheromatous vessels.

(4) Proximal ligation, having been rendered much safer of late by the use of aseptic precautions, less absorbent ligatures and the avoidance of all injury to the arterial walls by employing the "stay-knot," is permissible when the arterial walls are relatively sound until experience decides whether or not "needling" is superior in its results.

(5) Since recurrence after proximal ligation almost certainly results from non-deposition of white thrombi, and their maintenance in contact with the aneurismal wall from lack of proper changes of its lining, "needling" is then clearly indicated.

(6) Where the location prevents proximal arrest of the blood current "needling" is the best operation; possibly distal compression—rarely feasible—might aid in the deposition of thrombi.

(7) For the reasons already given, although occasionally successful, the indications for the permanent introduction of such foreign bodies as wire, horse-hair, etc., into aneurismal sacs are so much better met by "needling" that such procedures had better not be adopted.



(8) The modern revival of the older method of extirpation of aneurisms should not be attempted for spontaneous cervical aneurisms.

#### THE TREATMENT OF THORACIC ANEURISMS.

(1) All methods should be aided by the employment of rest in bed and proper diet.

(2) The permanent introduction of foreign substances should not be employed.

(3) "Needling" should be tried, aided by distal compression, when feasible, during the use of the needles; if this fails, distal ligation should be resorted to.

(4) Distal interruption of the blood current by simultaneous ligation of the carotid and subclavian arteries may be tried.

(5) "Needling" is indicated when complete or partial failure follows distal ligation.

#### THE TREATMENT OF ABDOMINAL ANEURISMS.

(1) All methods should include recumbency and diet.

(2) "Needling," when this can be done without injury to the hollow viscera, is the most promising plan.

(3) Proximal or distal compression may be tried, with or without "needling," but to be effectual must be done under anæsthesia.

(4) The permanent introduction of foreign bodies into the sac is inadvisable (see Proposition No. 7, Carotid Aneurisms).

THE IMPORTANCE TO THE SURGEON OF  
FAMILIARITY WITH THE BACILLUS  
COLI COMMUNIS.<sup>1</sup>

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THE bacterium coli commune was first described, in 1885, by Escherich,<sup>2</sup> and was at first regarded as a saprophyte and intestinal parasite. In 1887 Hueppe found it in the stools of patients suffering from cholera. Its positive pathogenic properties were first made known by Laruelle in 1889,<sup>3</sup> then by Tavel,<sup>4</sup> also by Roux and Rodet,<sup>5</sup> who fully established its pyogenic properties.

It would appear unnecessary here to go into its morphology. Suffice it to say that it is a short, rod-shaped organism, its shape causing it to be generally known as the *bacillus coli communis*, which in the hanging drop is motile, its motility consisting in a sort of oscillation, sometimes with a rapid translation. Its possession of flagella is disputed; at most, it does not have more than three of them, while the typhoid bacillus possesses from eight to twelve. It attacks peptone slowly, and glucose and lactose much more readily. It seems to enjoy a sort of commensalism with other organisms, possibly even a symbiosis. In

<sup>1</sup> Read before the American Surgical Association, at Buffalo, June 1, 1893.

The writer desires to acknowledge his indebtedness to the monograph of Dr. Maxime Macaigne, "Le Bacterium Coli Commune" (Paris, 1892), to which he would refer those interested in the subject.

<sup>2</sup> Fortschritte d. Med., 1885.

<sup>3</sup> Périlonite par Perforation, La-Cellule, 1889.

<sup>4</sup> Thyroidite, Correspondenzblatt f. Schweizer Aerzte, 1889.

<sup>5</sup> Lyons Médical, 1889.

the healthy intestinal canal it practically never exists alone, but it is found alone in other parts of the body under certain conditions, with some of which this paper has to deal. Its discoverer, Escherich, was able to determine a most significant feature in the life history of its organism, *i.e.*, that it varies in virulence within very wide limits, while he and others have shown that in what we may call its normal or ordinary state it is not usually virulent. This will account for the slightly infectious property of the pus met with in certain intra-abdominal abscesses. Under certain conditions, as during some but not all diarrhœas, but especially those of the summer season, it gains in strength or virulence to a marked, and frequently to a fatal, degree.

To it has been ascribed by various observers the property of rapid migration after death. For instance, Letienne has found it in the bile, where it is not supposed to be normal, within forty-five minutes after death; it also invades other organs soon after, if not before, death, since Welch found it in various organs in thirty-three out of 200 autopsies.<sup>1</sup> This apparently rapid migration is probably fallacious, it being more likely that it escapes from its normal habitat, the intestinal canal, before death.

That it varies in virulence within wide limits is most certain, its variation commonly finding its highest expression in cases of cholera nostras, since when recovered from these cases and inoculated it usually causes death from acute septic infection within twenty-four hours. This virulence it can retain in cultures for several months, although those on agar lose it much more speedily than those in bouillon. Cultures may thus be intentionally attenuated until virulence is completely lost. Welch has noted death in small animals in six weeks after inoculation, from an apparently non-septic cachexia, with atrophy of the spleen.<sup>2</sup> When it manifests pyogenic properties and causes pus it appears to be because it has become, in a measure, attenuated. When

<sup>1</sup> Medical News, December 12, 1893.

<sup>2</sup> Blachstein, working in Welch's laboratory, showed that injection of 1 c. c., or even less, of bouillon culture of colon bacillus in the ear veins of rabbits may cause the death of the animals as long as six weeks after the inoculation. These animals were much wasted, and presented peculiar appearances in the liver and bile. The latter contained the colon bacillus in large numbers.

death occurs, however, and seems due to suppuration produced by it, although probably due to an intoxication, the bacilli are rarely found anywhere else save in the pus. Apparently, then, we have to deal with the organism under two conditions: at one time as an exceedingly active agent, producing acute septic infection, and again as a common pyogenic organism, producing local abscess. Quite recently Gilbert and Lion<sup>1</sup> have published the results of certain investigations into the action upon the gray matter in the cord of ptomaines or toxins produced by this organism. According to these observers this toxic agent appears to be capable of setting up an acute infectious central myelitis. If this be true, we have an explanation for certain paralyses which occasionally followed acute enteritis and urinary infection.

*Identity with Organisms Otherwise Known.*—There is good reason for believing the bacillus coli communis to be identical with organisms discovered by others and given various other names. Thus Weisser appears to find complete identity between this organism, the bacillus Neapolitanus of Emmerich and Brieger's fæces bacillus. In 1885 Passet described a bacterium from a perirectal abscess, which he called bacillus pyogenes foetidus. While Passet's bacillus has usually been found in abscesses occurring in the neighborhood of the lower bowel, I have myself, for instance, found it in an abscess of the brain. Although there is complete morphological identity between this one and the colon bacillus, the former renders bouillon with glucose acid, but without gas production. In other media there are also very trifling differences. Nevertheless, there is great reason to think that these trifles and discrepancies may be fairly regarded as due to variations into which the question of polymorphism also enters. Tentatively, at least, we may regard them as identical.

Recently Clado and Albarran<sup>2</sup> have described a urinary pyogenic bacterium which Morelle and Krogus have considered identical with the bacillus lactis aerogenes. And now Achard

<sup>1</sup> Société de Biologie, Feb. 13, 1892.

<sup>2</sup> Compt. rend. Soc. de Biol., 1891, p. 830.

and Renault regard both of these as identical with the colon bacillus.<sup>1</sup>

Should these identifications prove correct, they would serve to show how generally wide-spread this organism is, and of how much more importance in a pathological sense than was at first supposed, while if incorrect they need in no wise detract from it. (The colon bacillus, moreover, presents striking analogies with the bacillus dysentericus of Chantemesse and Widal, the bacillus endocarditis of Gilbert and Lion, the bacillus enteritis of Gärtner). Of greatest importance, however, is it to emphasize that the colon bacillus is positively distinct from that of typhoid as described by Eberth. It has ordinarily the property of producing, if any pathogenic effect, an acute desquamative enteritis, forming at the same time certain toxic agents upon which the catharsis characteristic of this condition probably depends. But almost throughout the foreign literature on the subject I have found what seems to me too great a tendency to regard the extra-intestinal presence of the bacillus as a sort of cadaveric or post-mortem invasion. I have myself found it too often in pus from living patients, who have rapidly recovered after its evacuation, to permit me to take this view of it.

*Pathogenic Action.*—The following paragraph I quote from a paper by Welch, of Baltimore,<sup>2</sup> as being most illustrative and succinct: "Tavel's observations of the colon bacillus in connection with wound infection were followed by a few isolated observations of this organism either in the unchanged organs of the body or in suppurations, until recently A. Fränkel reports its presence in nine out of thirty-one cases of peritonitis. I first came across this bacillus in the organs of the body in 1890 in a case of multiple fat necrosis with pancreatitis, which I reported to the Association of American Physicians. As in this case diphtheritic colitis existed, it seemed probable that the lesions in the intestine opened the way for the entrance into the circulation

<sup>1</sup> The question of identity of the typhoid and the colon bacilli is considered at some length in an article by Trambusti in the *Centralblatt f. Allgem. Path.*, 1892. No. 8, May 1.

<sup>2</sup> Transactions of the Congress of American Physicians and Surgeons, Vol. II, p. 5.

of this inhabitant of the healthy intestinal canal. This view subsequent experience has confirmed, etc.

"I have almost uniformly failed to find it outside of the intestinal wound when no demonstrable lesion of the mucous membrane existed. I am, therefore, prepared to say that this bacillus is an extremely frequent invader in intestinal disease. Moreover, the colon bacillus does not invade the blood and organs in the process of post-mortem decomposition.

"The cases in which we have found the colon bacillus under circumstances pointing to its pathogenic action have been as follows: Perforative peritonitis, four cases; peritonitis secondary to intestinal diseases without perforation, two cases; circumscribed abscess, three cases; and laparotomy wounds, six cases.

"Its presence several times in pure culture, in laparotomy wounds treated aseptically, although apparently not a source of serious trouble, was not a matter of indifference. It was generally accompanied with moderate fever, and a thin, brownish, slightly purulent discharge, of somewhat offensive, but not putrefactive, odor. The smooth and rapid healing of the wound was interfered with. In some of the cases there was evidence of intestinal disorder; in others this was not apparent, and infection from without could not be excluded.

"For the purpose of the present discussion, perhaps the chief interest of our observations concerning the colon bacillus is that they furnish an illustration of the possible predisposition to infection afforded by intestinal lesions, and also give an example of the much disputed auto-infection."

The above remarks of Prof. Welch were part of an address before the second Congress of American Physicians and Surgeons, in a discussion in which I was co-referee. If I may be permitted to quote from myself, I would like to repeat the following sentences from a paper which I read on that occasion:<sup>1</sup> "One form of entero-sepsis upon which but little has been written, and yet which furnishes a clue to many fatal cases,

<sup>1</sup> Transactions, p. 37.



especially those connected with abdominal surgery, is that produced by the bacillus coli communis. This is well known as a regular inhabitant of the alimentary canal, and its presence there is presumably connected with the chemistry of digestion. Yet, under certain circumstances, it either escapes or is carried beyond its normal limits, and, entering the portal circulation, perhaps the lymphatics also, appears to set up septic disturbances which are typified by the production of septic peritonitis, and possibly other forms of septicæmia in which the peritonæum does not primarily figure. The subject is an inviting one for further research. The condition has hardly yet been dignified by a proper name, though Drs. Welch and Councilman, who should be credited with its discovery, term it *colon infection*." These remarks were made in September, 1891, and the principal purpose of the present paper is to elaborate the ideas therein conveyed.

Welch's first observations on the colon bacillus were in April, 1891. He says, that "we have now found them in one or more organs of the body in thirty-three autopsies out of about 300. The suspicion at first entertained has been abundantly confirmed, namely, that lesions of the mucous membrane of the intestine open a way for the invasion of the colon bacillus into the blood and lymphatic vessels, and thence into the various organs and parts of the body. They were found with especial frequency in the lungs and kidneys, in the liver, mesentery, glands and spleen." It is not necessary that ulcerations or other perceptible lesions of the intestinal mucosa should exist, but it is certain that such invasion is a frequent result of the lesion. Colon bacilli were demonstrated by Welch in various organs, and this was true, especially in cases of amœbic dysentery. Certain cases, therefore, in which the bacillus seems to be a harmless invader should make one cautious in attributing pathogenic powers to it, unless it can be shown that other causes can be excluded. Welch concludes, however, that the colon bacillus may be the cause of lobular pneumonia, since he has found it in pure cultures in several such cases. In two cases of gall bladder lesion the bacillus was very abundant in the bile, which contained no other organism.

*Infection of the Biliary Passages.*—So far as the liver and biliary passages are concerned, the path of infection from the colon up to the common duct is widely open, and the wonder is that infection from this source does not happen much oftener. A further discussion of this subject might easily carry us into the consideration of lithiasis and disorders of biliary function, due to a mild infection from this source; indeed, this has already been discussed in the German Congress of Physicians, in Wiesbaden, in 1891; but to discuss it here would take us too far from our prime object.

Biliary colon infection may be primary or secondary, due in a measure to mechanical obstruction, or to direct passage of the organism, and may be accompanied by mild or severe manifestations of icterus, or by the lesions and symptoms of angio-cholitis. Indeed, the infectious form of icterus is nearly always due to colon infection, which, however, presumes nothing special in its symptomatology. The second form of icterus, due especially to biliary calculi, is by no means rare. Angio-cholitis naturally plays the principal rôle here, with or without multiple abscess of the liver. Several illustrative cases of each kind are reported by Macaigne.

Naunyn has called attention to the possible relationship between the formation of gall stone and the growth of this bacillus in the biliary passages. Several of the French writers consider suppurative inflammation of the biliary tract mainly due to the penetration of the colon bacillus. This makes no demands on the imagination, of course, since anatomically the path is widely open for them.

Bignami<sup>1</sup> found pure culture of the colon bacillus in one case of suppurative angio-cholitis with disseminated abscesses of the liver. On injecting cultures of the same into the biliary passages of guinea-pigs he succeeded in provoking identical disturbances.

In brief, beside a rapid infection of the biliary system, with total degeneration of the parenchyma, and manifestations of acute jaundice, the colon bacillus gives rise to a more slow

<sup>1</sup> Bullet. della R. Accd. med. di Roma, 1891, F. IV & V.

alteration of biliary passages characterized by catarrhal and suppurative angio-cholitis, with production of necrotic foci and hepatic abscesses, all of which may run a peculiar clinical course without fever, or at least with less pyrexia than is found when the same trouble is caused in an ordinary pyogenic cocci.

*Peritonitis.*—It was in 1885 that Cornil laid stress on the rôle played by intestinal bacteria in the production of perforative peritonitis; at that time, however, no final distinctions had been made. Such cases as those herein alluded to, together with many others summarized in the monograph of Macaigne, must make this matter now very plain. We must not forget in this connection the researches of Wagner, Gravitz and others, who have shown how often the introduction into the peritonæum of various bacteria is inoffensive, providing only, and this is the important item, that the liquid in which they are planted be non-irritating, and in quantity not exceeding the capacity of the peritonæum for absorption. It will be seen at once, however, how this condition is violated in cases of intestinal perforation. It has also been established beyond doubt that the colon bacillus found in the pus of a case of suppurative peritonitis, of intestinal origin, is capable of reproducing the same condition in animals, and must, therefore, doubtless be the active factor. In substantiation of these statements Macaigne adduces eighteen cases, and others have been put on record by other observers. It would appear, then, that we may have a colon infection in the peritonæum from intestinal lesions which do not go to the point of perforation.

Chantemesse, Widal and Legry have reported the following cases of pseudo-puerperal infection by the colon bacillus:

A woman four months pregnant was seized with acute obstruction, due to uterine retroversion. She soon appeared like a cholera patient without the diarrhoea. The retroversion was reduced, the rectum emptied, and she improved. Two days later, and eight days after the first trouble, she miscarried. The uterus was curetted, and cultures from the placental debris showed colon bacillus and no other organism. Four days later she died, and on the autopsy the peritonæum was found to contain greenish sero-pus, with gangrene of an

intestinal loop. In the fluids examined, including the blood from the heart, there were only colon bacilli.

Lesage reports the following case of sub-acute enteritis, abortion and fatal peritonitis produced by the colon bacillus:<sup>1</sup>

A young woman, ailing from diarrhoea and anorexia for four days, aborted at the fourth month, then had diarrhoea and fell into a typhoid condition. Six days later her uterus was curetted, and then the condition was regarded as febrile sub-acute enteritis. On examining the stools virulent colon bacilli were found. At the end of the third week the abdomen was distended and pyosalpinx was diagnosed; she died on the thirty-fifth day of her illness. Autopsy showed adhesive and localized peritonitis with foci of pus and pyosalpinx. Cultures from this pus gave colon bacilli and nothing else.

Varvachi<sup>2</sup> reports six cases of perforative peritonitis during the course of typhoid, in which he examined the peritoneal exudate, in all of which he found the colon bacillus, in three cases mixed with other forms; it was also found in the heart blood.

Malvoz<sup>3</sup> also reports six cases of peritonitis, mostly of the non-perforative variety, secondary to acute intestinal lesions, in all of which the colon bacillus seemed to be the active infectious agent; it being also found in the heart blood.

It is in cases of perforative peritonitis that the colon bacillus is most often found (though not always in the exudate) and sometimes alone. In three cases of peritonitis due to intestinal ulceration, without perforation, Welch found these bacilli in large number and uncontaminated. The exudate was sero-fibrinous, and not distinctly purulent. In one case of ruptured tubal pregnancy the fluid withdrawn with the sterilized aspirator needle from the peritoneal cavity, before it was opened, yielded a pure culture of this organism. Welch has also found it in peri-appendical abscess, but he emphasizes, as do others, and as would I, that it is a mistake to say, as Malvoz has recently said,

<sup>1</sup> Macaigne, p. 67.

<sup>2</sup> Lo Sperimentali, Aug. 15, 1891.

<sup>3</sup> Archives de Med. Experimentale, No. 5, 1891.

that all cases of peritonitis due to intestinal lesions are referable to the colon bacillus. Welch also found it pure in a case of tumor adherent to an ulcerated cancer of the rectum.

He also emphasizes the importance of remembering that typhoid ulceration opens the way for invasion of the colon bacillus, and that on account of the morphological resemblance of the two organisms a mistake in statements might easily be made.

At a meeting of the Société de Biologie, Paris, January 24, 1891, Marfan and Lion reported two cases of elderly individuals dying of collapse after acute enteritis. There was found infection of the mesenteric glands and the pericardial fluid, as well as the heart blood. The cases had run a course absolutely without fever, and died of collapse without their severity being realized. Later, at the session of December 12, 1891, Achard and Renault reported finding the colon bacillus in a case of nephritis. Reblaud voiced his views with regard to the pathogenesis of cystitis in women, he having found in a number of cases the bacillus pyogenes, which we now suppose to be identical with the colon bacillus.

At the meeting of January 30, 1892, of the same society, Clado, in a lengthy communication upon the anatomy of the vermiform appendix, stated that in three cases of appendicitis with abscess he had found the colon bacillus in pure culture. At this meeting and the next one the subject of its pyogenic properties was discussed. Lesage took ground that the organism produces pus, as in the gall bladder, the peritonæum and the territory around the cæcum, and that it does not produce general infection, at least as a rule; but it was possible to have a more and a less virulent form of the organism in the same case. This is illustrated in a case of abscess of the lung after infectious enteritis. Gilbert and Lion spoke particularly of the paralyses which may follow colon infection, and particularly of that of the intestinal and genito-urinary tract; they having often seen paraplegia after inoculation of guinea-pigs. At the session of March 5, Girode reported the case of a man suffering from dyspepsia, biliary vomiting, progressive icterus and albuminuria.

The pyloric region was the seat of an indistinctly circumscribed tumor. He died of collapse, and on autopsy there was found a large stone in the gall bladder, around which had formed an inflammatory mass, which involved the colon, duodenum, much of the pancreas and the gall bladder. The pancreatic and biliary passages contained pus, and there were numerous localized peritoneal collections. In all of these the colon bacillus and no other organism was found.

*Strangulated Hernia.*—In 1861, Verneuil expressed the thought that the liquid found in hernial sacs after strangulation would be found to contain toxic and irritating matter. In 1867 Nepveu, working for him, discovered cocci in such fluid. Since then Verneuil has repeatedly called attention to this subject. He explained the presence there of bacteria by their migration through the intestinal walls, which is often favored by injudicious taxis; from the sac they may pass into the general circulation or into the peritoneal cavity. In 1889, Clado<sup>1</sup> described numerous cases of choleric form strangulation in which he met with a bacterium in the fluid from the sac, especially under the three following conditions: (1) Dilatation and increase of intra-intestinal tension; (2) visceral congestion and ulcerations of the mucosa; (3) effusion into the peritoneal cavity, which might be invaded independently of the sac. From the sac the bacteria of hernial invasion spread and produce evidence of auto-intoxication, or before doing this they may localize themselves in some viscus and provoke the lesions described by Ledoux and Verneuil. Clado isolated from its source and studied the bacterium, which he found pathogenic after inoculation, and which in animals produced septicæmia, and which, moreover, has been found in all the viscera of patients dying of strangulated hernia. Now since the colon bacillus is fully known, it is recognized as identical with Clado's bacterium.

Garre<sup>2</sup> examined a number of cases of strangulation, and not finding microbes in all of the cases naturally concluded that they were not always present, and that the advice given by

<sup>1</sup> Congres de Chirurgie.

<sup>2</sup> Fortschr. d. Med., 1886.



Verneuil to always disinfect the strangulated loop and the sac is not so excessively urgent after all.

Bonnecken<sup>1</sup> found micro-organisms, for the most part the colon bacillus, in every instance of numerous experiments in producing artificial strangulation in dogs. He admits that in these cases death is largely due to septicæmia. When reduction is not accomplished the amount of the exudate is augmented beyond the power of the peritonæum to dispose of it. If the victim resists long enough he may have gangrene of the intestine and perforation in consequence.

Fränkel also sought the cause of death in rapidly fatal cases, and decided that the operation could not be blamed, since by itself it is too insignificant; nor could it be considered shock. It must, therefore, be of the nature of an infection and intoxication.

*Other Infections.*—Bourges claims that the colon bacillus is often found in the *tonsil* in scarlatinal angina; in seven such cases he three times found it associated with other microbes; in seventeen cases of pseudo-membranous angina due to scarlatina he found it four times, always with others. In every one of these cases it was cultivated and inoculated and found quite virulent. Other experiments have shown that in such cases it has a powerful virulence, but is capable of rapid attenuation.

Even in the *stomach* this organism is capable, now and then, of producing a local disturbance with necrosis of the mucous tissue, and consequent ulceration. Possibly by this same mechanism it may produce those ulcerations in the intestine after dysentery, which, according to Kelch and Kiener, are characterized by the appearance, as it were, of an eschar, the parts looking as if a strong caustic had been applied over a limited area.

Recalling the identity of the colon bacillus with Passet's bacillus *foetidus*, we see how it may be found outside of the lower end of the intestinal canal, as in the perirectal abscesses which are so common.

Mascattello<sup>2</sup> reports an acute abscess of the ischio-rectal

<sup>1</sup> Virchow's Archiv., 1891, B. 120.

<sup>2</sup> La Riforma Medica, 1891, No. 163.

fossa resulting from an ulcerative proctitis; it contained thick, offensive pus, in which only the colon bacillus could be found, and which, when cultivated and injected subcutaneously into guinea-pigs, produced acute abscess with the same offensive properties.

Although it does not concern the surgeon so much, it is very interesting to know that *endocarditis* may be caused by the colon bacillus, which provokes vegetation upon the valves in practically the same way as do those micrococci which commonly produce this disease in its acute infectious form. This has been proved in cases reported by Netter and Martha,<sup>1</sup> and by Lion and Menetrier.<sup>2</sup> This particular point has for me a very great interest, since I once lost a patient after operating for gunshot perforation of the intestine, who died of acute peri- and endocarditis, the autopsy showing no yielding of the intestinal sutures, and the local condition being perfectly satisfactory. For so sudden an endocardial lesion I could not account at the time. This occurred some years ago, in a case operated on in an emergency while I was in Bradford, Pa., upon quite different business. It occurs to me now that an explanation may be found in the facts above recited.

That the colon bacillus may give rise to an acute infectious *strumitis* has been shown by a case reported by Tavel.<sup>3</sup> This case is now almost classic, and concerns the removal of goitre with closure of wound, subsequent swelling and production of pus, in which were found only colon bacilli.

Macaigne states that there are at least six cases of acute meningitis on record in which the colon bacillus has been found. On account of its resemblance to the typhoid bacillus there is a possible source of error here, and yet it is as easy to account for one as for the other. Obviously the path of infection must be traced from the alimentary canal.

*Pulmonary Lesions Due to Colon Bacillus.*—Chantemesse and Widal were probably the first to show that in certain cases

<sup>1</sup> Archives de Physiol., 1886.

<sup>2</sup> Macaigne, p. 133.

<sup>3</sup> Correspondenzblatt für Schweizer Aerzte, July, 1889.

of bronchopneumonia the colon bacillus appeared to play the principal rôle as a pathogenic agent. About the same time, in 1891,<sup>1</sup> Macé and Simon de Nancy published a paper upon the infectious diarrhœas of children. In the cases which they reported they had found almost pure cultures of the colon bacillus in the stools, and concluded it to be the causal agent. In the lungs of those dying of the disease they found multiple lesions of broncho-pneumonia. They referred to the experience of Sevestre, who in 1887 presented a memoir on a similar lesion, and who laid especial stress upon the pulmonary complications of these cases. In a later communication he agreed with the writers just named, that the pulmonary lesions were doubtless due to the colon bacilli.

Since then it has been generally agreed among several writers that the organism has been found in great numbers, and unaccompanied by others, in the œdematous congestions and inflamed portions of the lungs. Among these writers are Welch, Cornil, Menetrier, and others. The last named had frequent opportunity during the epidemic of 1892, and frequently saw gray hepatization with gangrene in spots, and repeatedly found in the exudate the colon bacillus. Of much more importance for us, however, is the paper of Fischer and Levy,<sup>2</sup> who reported two cases of strangulated hernia with pulmonary complications, and who found in the broncho-pulmonic foci this colon bacillus. They emphasize the metastatic nature of the pulmonary lesions, considering them to be of intestinal origin. Certain it is that pulmonary complications do carry off patients after abdominal and intestinal operations, and that these fatalities should be carefully studied bacteriologically in the light of the few statements above made.

*Empyema Due to the Colon Bacillus.*—In 1888, Widal had to do with a case of ossifying pleurisy with subpleural abscess in an old man, after urinary trouble, and found in the pus which he withdrew the bacillus which had been described by Albarran under the title of pyogenes. We now know that Albarran's

<sup>1</sup> Revue Generale de Clinique et de Therapeutique.

<sup>2</sup> Deutsches Zeitschrift, f. Chir., 1891.

bacillus is identical with the colon bacillus; moreover, quite recently the same writer has found the same organism in the pus of cases of empyema, and there seems to be no doubt but that this organism may produce pus formation here as elsewhere. The probability is that in such cases the path of infection is from the mouth (saliva) rather than from the intestinal canal. These statements and views have been confirmed by Gilbert and Girode as well as by Dumontpallier.

The normal existence of the colon bacillus in the mouth, its occasional migration into inflamed bronchi, and the subsequent localization of its activity in the lungs or in the pleura are not difficult to understand. It is more difficult to account for its presence within the cranium and the production of *meningitis*, or its migration to the serous membranes of certain joints and the production there of collections of pus. Both of these things, however, are possible, and cases confirming this view have been reported by French authors.

#### GENERAL CONCLUSIONS.

These are, first of all, that this organism, which is constantly present in the intestinal canal, is not always a harmless inhabitant, but becomes at times an active invader. It does not confine itself alone to the intestinal mucosa, where it may set up most active desquamative lesions, but may pass this barrier and penetrate into the general circulation and exercise pernicious activity in numerous other organs, with toxic effects upon the system at large.

Paraplegia and other paralyses are known to be sequelæ of colon infection of various abdominal viscera; kidneys, liver, etc.

Herniary cholera, so called, is due to intoxication from the toxic products produced from the organism in its virulent condition.

While still confined to the alimentary canal, under certain conditions, it may give rise to infarcts as well as ulcerations, their gravity depending largely upon the activity of absorptions of toxic products.

From the intestinal canal the colon bacillus may ascend

along the biliary passages, determining at one time chole-cystitis, angio-cholitis and local necrosis, or at another multiple abscess in the liver.

It is known to be one of the frequent factors in peritonitis of intestinal origin. It ranks among the most active agents in cases of urinary infection, *e.g.*, cystitis, pyelitis, pyelo-nephritis, etc. Without going minutely into the question of identity of various bacillary forms found in the urine, especially in cases of septic urinary affection, it would be enough for the present purpose to insist that in the kidneys, as well as in the bladder, the colon bacillus may exert active pathogenic and pyogenic properties, and may be the active agent in producing cystitis, suppurative pyelitis and their kindred disturbances, as well as pus elsewhere, general infection and intoxication. These organisms may be introduced from without, as upon a catheter, or may be transferred from their normal habitat by some traumatism or by natural channels. In animals, at least, these microbes are in some measure eliminated by the kidneys after being injected into the circulation. The endocardium, the meninges, the pleura, articular serous membranes, and the lungs, are at times not exempt from the manifestations of its activity.

When ordinary antiseptic precautions are observed, it is probably the most powerful enemy with which the laparotomist has to contend. This fact gives plausibility to the views of those who claim that the best preparation for abdominal section is free catharsis for a few days previous to the operation. The researches of the past two or three years with regard to this organism have certainly justified the views which I have held and taught for some years, that there is a form of post-operative septicæmia which is due in no direct way to the operator or the operation, but is in fact that which it has often been called, *i.e.*, enterosepsis, or intestinal toxæmia, a genuine auto-intoxication, active and actual lesions being due to migration from the intestinal canal of the colon bacillus. The necessary inference from this is that constant attention to the intestinal canal should be the watchword of the surgeon, both in his preparation of patients for operation and his care of them thereafter. For a widespread

recognition of these facts I have elsewhere and more than once contended, but feel that the profession at large are not yet fully alive to their importance.

If I may sum up the conclusions of Macaigne, with which he terminates his excellent monograph, they are briefly as follows :

The colon bacillus has been identified with the bacillus Neapolitanus of Emmerich, the bacillus fœtidus of Passet, the bacillus pyogenes of urinary infection of Albarran and Clado, and the bacillus lactis ærogenes, and perhaps with other forms described by other authors.

Ordinarily inoffensive, it may from causes not yet ascertained acquire a greater or lesser degree of virulence, according to which it may determine one or more of the following lesions :

A. Infectious enteritis.

(a) Acute form.

1. The algid forms : cholera nostras, cholera infantum.
2. The pyretic form : post-puerperal pseudo-infection, etc.

(b) The chronic form.

1. The wasting enteritis of children and of adults.

B. Dysentery.

Then if the intestinal barrier is broken down we may have peritonitis and herniary cholera. *Probably most, if not all cases of appendicitis belong, also, under this head.*

The ascent of the colon bacillus along the biliary passages may provoke, according to its virulence, (1) simple biliary infection, (2) acute jaundice, (3) suppurative angio-cholitis.

In the alimentary canal it is capable of provoking—in the mouth, false membrane; in the stomach and intestines, infarcts; and lower down, perirectal abscesses. The bacillus penetrating the intestinal mucosa may infect parts or organs at a distance, for example, the endocardium, the thyroid body, the lungs, etc.

Finally, the bacillus may in some way, not yet fully understood, provoke meningitis, urinary infection, pulmonary and articular lesions.



## ILLUSTRATIVE CASES FROM THE PRACTICE OF THE AUTHOR.

CASE I—*Cancer of the Intestine with Abscess*.—H. C. G., aged twenty-two, was taken sick, apparently with dysentery, during which he rapidly emaciated and developed a tender, painful tumor to the left of and below the umbilicus. This tumor was watched some time, and finally showed evidences of the presence of pus. It was opened, under ether, and some 75 c.c. of foul-smelling pus evacuated from apparently a sub-peritoneal cavity, around which there was considerable induration. This cavity closed, then reopened, the tumor grew in size, and subsequently proved to be of malignant character, involving several loops of intestine in one firm, dense mass. The case was under the care of Dr. D. W. Harrington, and the operation was made by myself. In the pus from the above abscess no organism could be found save the colon bacillus.

CASE II—*Recurring Peri-appendical Abscess*.—H. T., aged forty-eight. This patient was operated on April 8, 1892, for acute peri-appendical abscess. In November, 1892, he returned with another large abscess pointing externally in the old scar. The appendix had not been removed during the first operation, for the reason that it could not be found without what seemed to be injudicious disturbance of the parts. November 26 the patient was operated on the second time, and nearly a pint of material evacuated. The pus from this case gave a pure culture of the colon bacillus, which, however, showed no special virulence.

CASE III—*Acute Abscess of the Liver*.—J. C., aged thirty-three. Four weeks previous to entering the hospital he was seized with sharp pain in the right side which caused him to give up work. Since then he has been very sick, and was brought to the hospital four days before the operation with a temperature often as high as  $106^{\circ}$ , with frequent chills, great soreness, and some swelling in the region of the liver. Referred to me by Dr. Chas. Cary, December 28, 1892. I anesthetized him and evacuated a very large abscess in the liver by incision between the tenth and eleventh ribs, just back of the axillary line. At the time of the operation about twenty-five ounces of thick, ropy pus slowly escaped. The temperature at once subsided, to remain low, and he made a rapid recovery. In his case the pus was a pure culture of the bacterium coli commune.

CASE IV—*Gangrenous Appendicitis*.—H. W., aged sixteen, was sent to the hospital by Dr. S. G. Dorr. This was a case of gangrenous

ous appendicitis of eight days' duration. Although the appendix was found gangrenous at the time of the operation, the patient had never seemed very sick. Two days before the operation he was able to walk, and when I first saw him, the day previous, he moved in bed without pain, and was not extremely tender, although the tumor was as big as my fist. From this, on the following day, several ounces of foetid pus were evacuated, and the appendix, almost completely gangrenous, was easily removed. He only stayed eight days in the hospital, and then went home nearly recovered. Pus from this case showed nothing but colon bacilli.

CASE V—*Acute Appendicitis with Perforation and Obstruction of the Bowels*.—H. J., aged forty-eight, gives a history of three attacks within the recent past of pain and soreness in the right iliac fossa. January 13, 1893, he was taken with very severe pain, and became a patient of Drs. Greene, with whom I saw him four days later, when he had faecal vomiting and all the signs of intestinal obstruction, but without any localized tenderness. The same day I operated, and after opening in the middle line, on exploring toward the right iliac fossa some slight adhesions gave way, and there came a gush of several ounces of fresh thin pus, having a strong faecal odor. As well as I could, under the circumstances, and by gas light, I examined the region of the caecum, but could find there no definite lesion. The patient died about fifty hours later, and on autopsy there was found a gangrenous appendix with circumscribed gangrene of the adjoining portion of the caecum. Examination of the pus removed at the time of the operation showed colon bacilli, and nothing else.

CASE VI—*Cholecystitis Suppurativa*.—During the same week I was called out of town to see an elderly woman in whose case both the history and the local symptoms pointed to an acute appendicitis, in fact, every sign of it was present save perceptible tumor. She had had chills and high temperature, and the tumor had been distinctly perceptible in that region within a day or two. Her chills were followed by an alarming collapse. An operation was deemed necessary at once. When I saw her in the evening her temperature was down, and she had involuntary stools, and there was tenderness across the lower bowels. Under ether I made a long oblique incision over the appendix, and upon working my way down to it found it perfectly free and apparently normal. Exploring upward I came upon a large distended gall bladder, and aspiration with a fine needle showed it

to be full of apparently sero-pus. I closed the lower incision, made a second one over the gall bladder, sewed it to the peritoneum with four fine silk sutures, and left it to be opened the following day. The contents of the gall-bladder, as withdrawn by the aspirating needle, showed a sero-purulent liquid which contained colon bacilli and streptococci. The patient made a final though slow recovery, over forty gall stones being later removed by Dr. Richmond, of Fredonia, N. Y.

ON A METHOD OF MAKING INTESTINAL ANAS-  
TOMOSIS, WHICH WILL PREVENT SUBSE-  
QUENT CONTRACTION OF THE  
ORIFICES.

By THEODORE A. McGRAW, M.D.,

OF DETROIT.

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THE cases are rapidly multiplying in which surgeons have observed the partial or complete obliteration, by cicatricial contraction, of the orifices of communication made by operations for anastomosis of the hollow viscera.

I have myself met with this result in dogs upon which I have operated with the elastic ligature. In one case of anastomosis, made between adjoining coils of the small intestine, I found at the end of three weeks the opening between the two nearly closed, and in several cases of operations between the gall bladder and intestine, the holes made by the ligature had nearly disappeared in the process of healing.

In the human subject, the recurrence of stenosis after operations for the production of anastomosis has been observed as the ultimate effect of all kinds of operations done for that purpose. It has been seen now many times, after operations by the old original method of sewing the edges of the cuts made through the opposing intestines, by two series of sutures, one, namely for the mucous and one for the serous and muscular coats. It has also been met with after operations by Senn's method and in a recent case after the use of the Murphy button. In the case reported by Dr. Keen, of anastomosis produced by the Murphy button, the opening of communication had diminished by one-half in the short period of forty-seven days. These results seem

to have occasioned a disagreeable surprise in the profession, and yet they are precisely what might have been foreseen from our knowledge of the effects of the contraction of scars elsewhere. We know very well that wherever there is a raw edge connecting two opposed surfaces, those surfaces will be drawn together and united by the resulting cicatricial contraction. Thus in webbed fingers, it is impossible to prevent the reunion of the fingers after incision unless we break the continuity of the scar by the insertion of flaps of sound tissue and in cleft of the soft palate, operations which have failed to heal by first intention will nevertheless usually heal by granulation, the separated edges being drawn again together as the scar advances.

If we ask what is the cause of the contraction of the opening of communication made artificially between any two of the

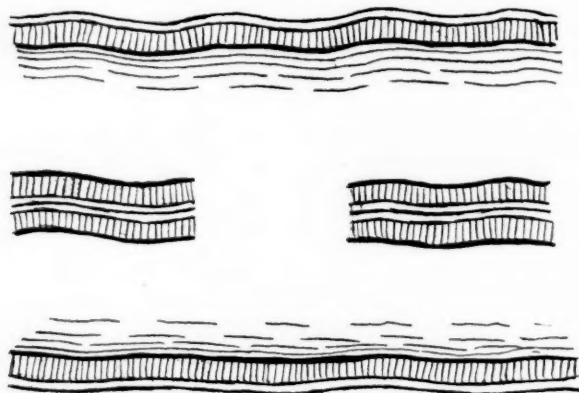


FIG. 1.—Intestinal anastomosis by lateral apposition, showing the broad raw edge.

hollow viscera, the answer would seem sufficiently plain. We should expect it to occur whenever the edges of the orifice are in the process of healing left raw and granulating, or whenever, after healing has taken place, that edge of cicatricial tissue becomes irritated by the passage of food or feces, and turned into a raw sore. When we consider the pathological conditions which must ensue after many of the various operations for intestinal anastomosis, we may indeed wonder that so few cases of

resulting stenosis are reported. In many methods a granulating wound must be the ordinary effect of the operation. Thus in all operations in which the viscera are brought together in lateral apposition by plates or rings of any kind, there can in the very nature of things be no primary union of the mucous membrane. The intention of the operation is to produce adhesion of the serous surfaces alone, and a wide granulating edge, uncovered by mucous membrane, bounds the entire circumference of the orifice. In the operation by Murphy's button, the button becomes detached by crushing the rim of tissue around the opening of communication until it sloughs and gives way, leaving behind a granulating wound, disposed to close after the nature of such wounds. The old operation of incising the opposed viscera and uniting them with double rows of sutures would seem to offer a better hope of permanency than the newer methods, for if the mucous membranes should chance to heal by first intention the orifice lined by an unbroken tissue would probably be permanent. In how many cases, however, there would be healing of the serous surfaces while the inner line of stitches, under the influence of septic and mechanical lesions, would give way and leave an uncovered and contracting edge, it is impossible to say. While all such orifices, made by any of the hitherto described operations, would be liable to contract and close, it is evident that the danger of closure would be in inverse proportion to the size of the opening. Some surgeons, therefore, have endeavored to secure themselves from failure by making orifices several inches long. It remains to be seen whether this method will prove effective; there may be some doubt also whether such large openings, if permanent, might not so weaken the bowels as to materially interfere with the propulsion of food. It is probable that the same process of gradual closure from cicatricial contraction will be found to take place, however large the opening may be made. In the case of anastomosis between the gall bladder and bowel, a very large opening would often be rendered impossible by the size of a contracted gall bladder. These openings are for several reasons more liable to close completely than similar orifices between two intestines. The flimsy structure of the gall bladder



offers less mechanical resistance to contraction than the thicker wall of the gut, the opening is of necessity smaller, and the thin fluid which passes through it does not tend to dilate it, whereas in the intestine the passage of food and fæces must, to a certain, perhaps small extent, have an effect similar to that of a bougie in a urethral structure. I cannot, therefore, agree with Dr. Keen, who rejects Murphy's button for intestinal anastomosis, but encourages its use for cholecystenterostomy. It is my belief, founded on certain experiences with the lower animals, that the most of the fistulæ, made by surgeons between the gall bladder and intestines close completely in a comparatively short time, and I should expect such a result more positively after the use of the

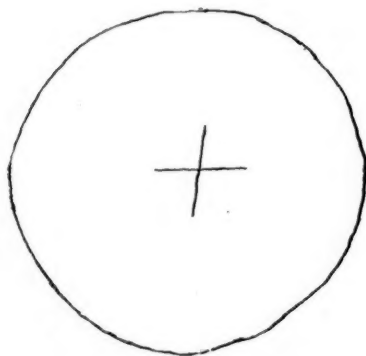


FIG. 2.—Cross-cut through gall making four flaps bladder.

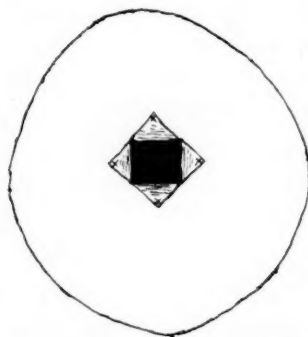


FIG. 3.—The same, with flaps turned back and sutured to the gall bladder, their serous surfaces in apposition.

Murphy button, with its crushing action, than after an operation in which the two viscera are carefully joined together with sutures.

It is evident that whenever an anastomosis between two viscera has become desirable, it is imperative that it should be permanent for this operation is almost never required for temporary purposes.

It is indicated, as a rule, only in permanent obstructions of the bowel or gall ducts. We use it to overcome a pyloric stenosis, or a biliary obstruction which we can meet in no other way.

It may be employed, though rarely, in some cases of acute intestinal obstruction, in which we may hope that the contents of the bowel will subsequently pass through the natural channel, restored to its normal condition by the subsidence of inflammation, and yet even in these cases we can never count upon a restoration of the old function of the bowel after the obstruction has been relieved by the establishment of an anastomosis.

For this reason surgeons engaged in this line of work have discovered this possibility of the contraction of these artificial passages with a feeling akin to consternation. Why should we expose the patient to the dangers of such an operation as that for the establishment of an intestinal anastomosis if in a few months our work is to be rendered useless, and the patient plunged again into the old trouble by the closure of the opening.

At the last meeting of the American Surgical Association at Buffalo, I presented some specimens of anastomosis made on the lower animals, between the gall bladder and intestine, and between two neighboring coils of intestine, produced by a new operation which will, I believe, overcome this difficulty and make permanent openings, not liable to contraction.

The principle on which the operation is based is the same as that which we make use of in operating for webbed fingers, namely, to break the line of scar by the interposition of sound integument or mucous membrane.

As the edge of the artificial opening contracts by reason of the granulations and scar tissue which line it, I try to replace that tissue with an unbroken mucous membrane which is not subject to contraction. This may be accomplished differently as we have to deal with the gall bladder and intestine or two coils of intestine. In the first instance, when making a cholecyst-enterostomy I proceed as follows: Exposing the gall bladder, I make a cut in this viscus at its most prominent part and let out the bile. To this cut, I now add other cuts in such a way as to form flaps. These flaps may be made in a variety of forms. We

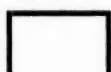
may, for instance, by two cuts crossing each other at right angles make four triangular flaps, thus:



or we may make two flaps, thus:



or content ourselves with one, thus:



In either case, by turning the flaps back on to the gall bladder so as to bring their serous surfaces together and fastening them there with sutures of fine silkworm gut, we secure for the opening in the gall bladder a mucous edge which, according to the

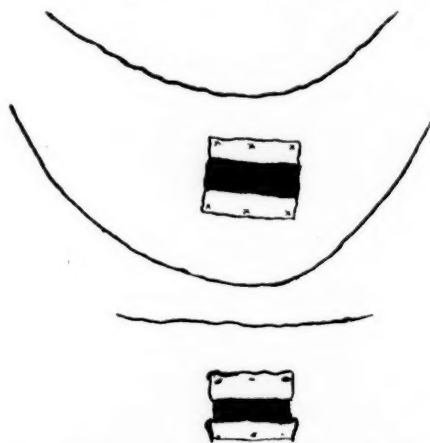


FIG. 3.—Flap made in stomach and small intestine turned back and sutured to serous surfaces.

method of flap formation adopted, bounds the orifice either completely or in part. Four flaps, cut as described above, will make the most complete result, for the four sides of the orifice will then be composed of the inner surface of the four flaps where they are turned back on themselves as on hinges. The other modes of incision will leave raw edges, adjacent to the mucous edges,

which will inevitably contract and lessen the size of the openings. The flaps thus sutured will soon unite with the gall bladder by adhesive inflammation, and the orifice thus formed could not possibly contract to any great extent.

After the gall bladder is thus prepared an incision is made in the intestine and the serous surface of the gall bladder just above and behind the flaps is sewed to its posterior edge. The gall bladder is then tucked into the intestine so that it projects into its cavity like a nipple, with the newly made opening at its lowest part. By means of numerous sutures, the serous surface of the gall bladder is united all around to the serous surface of the gut. These sutures should be placed in the gall bladder above the ends of the everted flaps, but in the intestine through the edge of the incision.

The result of this operation will be to make an artificial passage from the gall bladder into the intestine, lined with a mucous membrane, which will descend within the nipple-like prolongation to return on its outer surface until it joins the mucous lining of the intestine. What scar there would be would be above the orifice through which the bile would discharge into the intestine, and an obliteration of the passage by its contraction is hardly conceivable.

When the anastomosis is to be made between two coils of intestine we have to proceed in a different manner. We can not very well insert one gut into another, unless, perhaps, when joining the small to the large intestine. In that case the ileum could be inserted into the large intestine in the same fashion as the gall bladder with intestine.

In other cases, as when forming an anastomosis between stomach and jejunum, I first make an incision in the stomach on its lower surface and midway between the two curvatures. At the end of this longitudinal cut I join two transverse cuts thus



making a long flap. Turning this flap back on its attached part as on a hinge, I attach it by means of Lembert sutures

to the adjacent serous surface of the stomach. A similar flap is made in the jejunum, but on the opposite side. We have then in each viscus an opening, one edge of which is lined by everted mucous membrane and the other edge of which is raw.

In bringing the viscera together the raw edge of one comes opposite the flap of the other and *vice versa*, and in sewing them together, each raw edge is fastened to the serous membrane of the other viscus just outside of the everted flap. In actual prac-

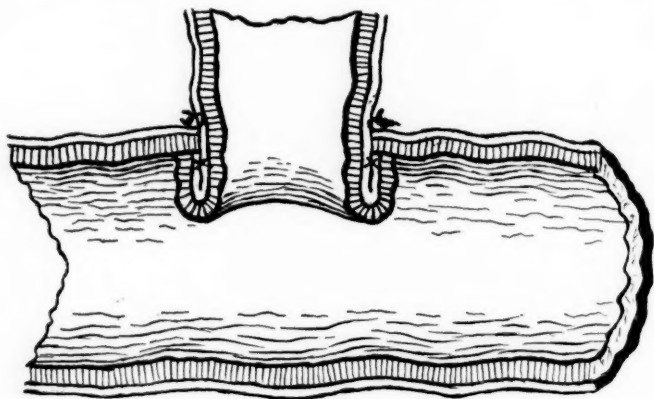


FIG. 4.—The gall bladder turned into the intestine and held there by sutures through the serous and muscular coats.

tice, after making the flap in the stomach, I attach the bowel to it before incising it, and thus simplify the procedure.

It is evident that this procedure could be varied indefinitely, provided the object is kept steadily in view of lining the new-made orifice with mucous membrane, and bringing the line of union to a place where its contraction could not produce closure.

These methods of operating are not difficult, neither do they require the expenditure of much time, and I believe that they will prove efficacious in the prevention of subsequent stenosis.

## TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

*Stated Meeting, April 3, 1893.*

The President, DR. WILLIAM HUNT, in the Chair.

### THE CONTROL OF HÆMORRHAGE IN AMPUTATIONS AT THE SHOULDERJOINT.

Dr. JOHN H. BRINTON reported two cases as follows:

CASE I.—A man, forty-eight years of age, who had suffered for twenty-three years from osteitis deformans of the right tibia, sustained a fracture of the anatomical neck of the humerus in June, 1892. Under treatment union was secured without complication. Three months later, however, he presented himself with evident malignant disease of this bone, a tumor having developed in it in the immediate vicinity of the injury. Disarticulation was done, and at the operation, performed October 5, 1892, to prevent hæmorrhage, the long steel pins suggested by Dr. John A. Wyeth for use in amputations at the hip joint, were used; one transfixing the anterior axillary fold in front of the vessels, penetrating the tendon of the pectoralis major muscle, and emerging near the end of the acromion; the second needle pierced the deltoid and emerged just below the acromion. By carrying the needles, especially the anterior one, well upward, the constricting rubber band, which was then applied, was placed so high as not to prevent the rotation of the humeral head, or to interfere materially with its disarticulation.

This patient suffered very slight loss of blood at the time of the operation, and received but little shock. He reacted promptly and perfectly, and for several days did well, the wound uniting throughout. On the night between the fifth and sixth day the temperature rose to  $104.5^{\circ}$ , and a copious eruption, similar to that of measles, appeared on the abdomen and chest, and eventually invaded the extremities, and, indeed, the whole body. There was marked



coryza, and the tongue became brown and dry. This condition resisted all treatment and the free use of antipyretics. As the eruption spread, the temperature still rose, reaching  $107.5^{\circ}$  and  $108^{\circ}$ , and the patient died on the afternoon of the 15th of October, the tenth day after the operation, death being doubtless due to some form of septic infection not easy to determine.

CASE II.—A boy, aged ten years, suffering from an enchondroma of the humerus, close to its head, having a diameter of two and a half inches, and interfering with the joint motions by its bulk. Disarticulation was done November 28, 1892, and the elastic constrictor and steel pins were again resorted to.

The anterior pin was made to emerge three-quarters of an inch above the tip of the acromion. As a result, the circular turns of the tubing rested on a somewhat higher level than in the preceding case. Perfect freedom of the joint was preserved, and its disarticulation was not unimpeded. A roller bandage was applied as a compress under the tubing and directly over the artery. Hæmorrhage was thus perfectly prevented, and the removal of the limb, as in the former case, was practically a bloodless procedure. This boy recovered without accident. In both these instances an Esmarch elastic bandage was applied previous to the insertion of the pins.

Dr. WILLIAM W. KEEN, who assisted in these operations, remarked that he had never seen any better method of controlling hæmorrhage in such cases, and that in his opinion it is vastly superior to the method devised by himself some years previous.

In the first of Dr. Brinton's cases the pins were brought out at the end of the acromion process, and when the head of the bone was removed the skin slipped down and the constriction of the tube partially obliterated the cavity where the head of the bone had been. In the second case, the pins emerged three-fourths of an inch from the tip of the acromion, and there was no trouble from the slipping of the tube downward.

#### ENTERECTOMY FOR OBSTRUCTIVE EPITHELIOMA AT THE ILEO-CÆCAL VALVE; SECONDARY ANASTO- MOSIS BY ABBE'S LONG INCISION.

Dr. JAMES M. BARTON reported the case of a man, twenty-seven years of age, whom he first saw when in a state of great exhaustion from obstructive bowel symptoms which had already lasted some

weeks. Some obstruction in the vicinity of the ileo-cæcal valve was diagnosticated, and for the relief of this an incision, about three inches long, similar to the incision required for the removal of the appendix, was made in the right inguinal region. The ileum was found to be the seat of epithelioma and intussusception. The intussusception could not be reduced. About six inches of the intestine, including the obstructing epithelioma, were excised, and the operation terminated by making an artificial anus, on account of the threatened collapse of the patient. He recovered rapidly; gained in strength and flesh, and at the end of two months was again subjected to operation for closure of the artificial anus after anastomosis.

A three-inch incision was made about two inches to the left of the median line and parallel with it, ending just above Poupart's ligament. The ileum was readily identified, and as the transverse colon hung well into the wound, the sigmoid flexure was not searched for. After stripping the required portions of the bowel of their contents, and preventing their return by a temporary rubber ligature, the ileum and colon were laid side by side and joined by a line of suture five inches long; when completed, the needle was removed and the unused thread permitted to remain. A second line of suture, four and a half inches long, parallel and close to the first was introduced, and the unused threads were also permitted to remain.

Both bowels were then opened by a four-inch incision about a quarter of an inch from the last suture. A third suture was used to join the edges together, passing each stitch across the freshly divided edges so as to check the bleeding. This stitch is known among seamstresses as a "whipping stitch." The pliability of the intestines was such that not only the distal edge could be so closed, but a large portion of the edge on the side of the incision toward the operator. A needle was now placed on the unused thread attached to the second line of suture, and this was continued around the ends and in front of the opening, joining the intestines together at about a quarter of an inch from the opening and parallel to it. This suture, when completed, entirely surrounded the opening, and was about a quarter of an inch from it. Lastly, the unused thread of the first suture, which was still hanging at the end, had a needle put on it, and was carried around the ends and in front of the opening. This suture when completed also surrounded the opening and was about half an inch from it.

The operation can be quite rapidly performed, the intestines being held in contact by an assistant. After the first line of stitching is made it is still easier, and the suture can be made nearly as fast as the same operator would sew a seam in muslin.

The whole operation was performed with a constant stream of tepid boiled water flowing over the intestines being joined together. As soon as the stitching was completed the intestines were replaced in the abdominal cavity, which was thoroughly flushed, and as the sutured intestines laid in position without undue strain the abdomen was closed.

The slight vomiting after the ether soon ceased. A number of ounces of fecal matter passed from the artificial anus, but less than before the operation. At the expiration of twenty-four hours there was occasional regurgitation of fluid from the stomach, and on the second morning the regurgitated fluid had become coffee-colored. An hour later, forty-three hours after the last operation, the wound was reopened, but no cause of obstruction was discovered. The sutured intestines lay quite stiffly in place, being kept so by the numerous lines of sutures and the resulting plastic deposit; the small intestine was rather sharply flexed at the extremity, but not enough to obstruct. After as full a search as the condition of the patient warranted, it was concluded that the obstruction must be at the sutured portion. A loop of the ileum above the anastomosis was therefore drawn into the wound and another artificial anus made, but the obstruction was unrelieved, neither gas nor fecal matters passed, and the patient died forty-eight hours later, or four days after the operation.

At the post-mortem there was no evidence of recent peritonitis anywhere, the cause of all the difficulty being an old adhesion of the ileum to the abdominal wall at the left iliac fossa. The trailing ileum upward from the original artificial anus in the right iliac fossa ran directly across the abdomen to the point of attachment in the left iliac fossa, making a tense band; it then ran downward, and six feet of it were in the pelvis. About two feet of these six had been drawn under the band and used for the anastomosis operation. The remaining four feet, still in the pelvis, were sloughing, its circulation being entirely shut off by the band. All the parts above the band, including the intestines used in the anastomosis operation, were in admirable condition. The immediate cause of the obstruction was

the increased tension of the band, produced by pulling another loop of intestine under it at the operation.

In performing this operation again the reporter stated that he should make the incision in the median line, and make it higher and longer, so that he might not only see the condition of the intestines, find any abnormal adhesions, but before joining the intestines might place them in position in the abdominal cavity so that they might lie without strain or tension. The intestines when joined by six sutures are as unyielding as if there were a piece of cardboard between them five inches long. If the intestine does not lie easily in its new position, the bowel at one end or the other of the stiffened portion may be so sharply flexed upon itself as to cause obstruction. In addition, from the same cause, there may be unnecessary strain upon the sutures.

The sutures in the above case were severely tested, the transverse colon was pulled upward by the gastro-colic omentum, while the ileum, a few inches below the suture, was fast anchored by the adhesion. This strain was greatly increased by the subsequent abdominal distention and frequent vomiting. But as the specimen showed, it held perfectly.

The specimen removed at the enterectomy shows almost complete obstruction, the opening that remains being less than a quarter of an inch in diameter.

DR. W. W. KEEN remarked that with regard to the question of contraction he had a patient on whom he did a gastro-enterostomy a year ago, making an opening only an inch and a half in length. He is still perfectly comfortable. But in spite of such a result in a single case he believes that the long incision advocated by Abbé is the right one.

Mr. Treves has a brief article in a recent issue of the *Lancet* reporting a case in which he removed a portion of the sigmoid and brought the bowel together end to end in a very simple way. He first sewed the mucous membrane of one end to that of the other all around, and then inverted the peritonæum with a simple Lembert suture. The operation was done in a comparatively short time and the patient recovered beautifully.

AN OVARIAN TUMOR WEIGHING ONE HUNDRED AND  
ELEVEN POUNDS REMOVED FROM A CHILD OF  
FIFTEEN, WHOSE WEIGHT WAS SIXTY-  
EIGHT POUNDS.

Dr. WILLIAM W. KEEN reported the case of Miss B., aged fifteen years, who, for two and a half years had been the subject of an intra-abdominal growth. It had been repeatedly tapped, and was finally brought to him for radical operation in April, 1893. Her abdomen was then enormously swollen.

The measurements were as follows: From the ensiform to the umbilicus,  $16\frac{1}{2}$  inches; from the ensiform to the pubes,  $29\frac{1}{2}$  inches; circumference, 49 inches. The veins over the abdomen very large. Nothing could be made out in the interior in consequence of the enormous abdominal distension. Examination of the urine showed no albumin and a very slight trace of sugar (?).

*Operation.* April 30, 1893. A small incision was made in the median line above the umbilicus, as the greater mass of the tumor lay there. A large trocar was thrust in and evacuated a very large quantity of characteristic opalescent ovarian fluid. The escape of this fluid revealed through the abdominal wall large masses lying especially under the liver and in the right iliac fossa. The incision was then enlarged until it measured, eventually, about eight inches in length. The hand introduced now revealed the growth to be an enormous ovarian cyst, reaching up to the diaphragm and pushing everything out of its way. There were a number of moderate adhesions, chiefly to the belly wall and the omentum. The viscera were, fortunately, entirely free. The pedicle was only  $2\frac{1}{2}$  inches broad. The tumor arose in the right ovary, the left ovary being healthy but small.

The weight of the solid mass removed was twenty-seven pounds, and by actual weighing the fluid removed weighed eighty-four pounds, making a total of 111 pounds. The child herself weighed but sixty-eight pounds.

After the removal of the tumor a curious looking abdominal cavity was exposed to view. It looked almost like that of an eviscerated cadaver in the dissecting room. The tumor had so pushed the liver to the right and backward, and the stomach to the left, that nearly the whole of the diaphragm was exposed, and flapped up and

down with the pulsations of the heart. Down the middle of the cavity the bodies of the vertebræ were entirely exposed, showing the aorta and vena cava to their bifurcations, the intestines being a very minor consideration and pushed to each side in the hollow of the ribs and the lumbar regions. When the abdominal wall was sutured the abdomen was excessively scaphoid, the anterior abdominal wall lying directly on the aorta and vertebræ. The puckering of the skin, although moderately marked, was much less than had been expected.

When the operation was completed a glass drainage tube was inserted, and she was put to bed in very fair condition, in view of the gravity of the operation. The tumor was a multilocular cyst.

The child made an uninterrupted recovery. The drainage tube was removed on the fifth day, when the discharge had become almost nothing, but three days later a slight rise of temperature took place, and the discharge recommenced. A small rubber drainage tube was therefore re-inserted for a few days. She sat up at the end of two weeks.

#### ILEO-COLOSTOMY BY MEANS OF MURPHY'S BUTTON.

Dr. WILLIAM W. KEEN reported a case of cancer of the hepatic flexure of the colon, in the course of the treatment of which first an artificial anus and later an ileo-colostomy by means of Murphy's button had been done. This report is published in full in the *ANNALS OF SURGERY*, June, 1893, page 652 *et seq.*

Dr. JOHN B. DEEVER remarked that it had been his fortune to see this patient in consultation, at which time she appeared to be developing an attack of intestinal obstruction. The abdomen was considerably distended, but he had no difficulty in convincing himself that she had malignant disease. Intubation of the colon was done and four quarts of water were thrown into the colon, and it was clearly demonstrated that the fluid was largely arrested at the hepatic flexure. He believed then that she had a growth in the neighborhood of the ileo-cæcal region, and that it involved the ascending colon.

Dr. Deaver further remarked that there is often a great difference between the clinical aspects of a case and the results of microscopical examination. While he has due respect for the pathologists, he knows that they are not always able to tell whether or not a



growth is malignant, or to draw the line between carcinoma and sarcoma. He therefore does not rely wholly upon the microscope.

He had had no experience with Murphy's button. He had done a number of anastomoses, having used the segmented rubber rings and, in one instance, Senn's plates. The objection urged against anastomosis with any form of appliance is the contraction which follows. The longest case after operation that he has is one of ileo-colostomy, done nine months ago. A one and a half inch opening was made and the segmented rubber ring employed. The Abbé operation seems to be less open to this objection.

Dr. WILLIAM J. TAYLOR stated that he assisted Dr. Keen in this operation, and had an opportunity to feel this mass, which, in spite of the results of the post-mortem, he persists in thinking a malignant growth of the hepatic flexure of the colon. The character of the growth was not that of a scybalous mass. It was very fixed, and surrounded by dense adhesions. In his opinion the specimen represents that portion of the colon up to this mass, where it was densely adherent.

## EDITORIAL ARTICLES.

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### THE DISCUSSION ON THE TREATMENT OF UTERINE FIBRO-MYOMATA AT THE RECENT FRENCH CONGRESS OF SURGERY.

At the Congress of French Surgeons, held at Paris in April last, one of the special topics set for discussion was the treatment of uterine fibro-myomata. Two considerations render the discussion of such a theme by this Congress especially significant. One, that the society to discuss it was one composed of general surgeons, thus indicating the sentiment among the French that the subject was one that should engage the attention of the general surgeon, and not be relegated to specialists or to obstetricians; second, that in the experience of those participating, and in those listening to the discussion, a very large material had been embraced, in estimating the value of which, the observers brought minds trained in the whole breadth of surgical endeavor. The subject was introduced by KOEBERLÉ, of Strasburg, who, after speaking of the general benignancy of these neoplasms, proceeded to dwell upon numerous peculiarities in their development which may render them dangerous: such are the conditions depending upon the age of the patient, the seat of the tumor, its size, relations, degenerative changes, excessive hæmorrhages, etc. When we have to deal with encapsulated fibromata in the true pelvis, or when the tumor lies either intra-uterine or closely beneath the mucous membrane, causing frequent and profuse hæmorrhage, surgical interference is demanded, whatever may be the age of the patient. An operation is contraindicated, however, in the case of very large fixed tumors, not increasing in size, especially when the menopause is close at hand. In the case of fibromata seated at the fundus of the uterus an opera-

tion is rarely indicated, for life is not often endangered, and when intervention is necessary, in Koeberlé's opinion laparotomy gives the best results.

PÉAN, of Paris, discussing the so-called benign character of these tumors, said that he had often been unpleasantly surprised in practice to find how little the statements as to benignancy agreed with the facts.

"Statistics of recent operations do not argue in favor of those who hold that the menopause leads to spontaneous relief. In 250 operations

30 were from 20 to 30 years.					
70	"	30	"	40	"
100	"	40	"	50	"
10	"	50	"	70	"

The menopause is really a critical age, and not a favorable one, as certain surgeons hold who seek thus to cover their lack of skill instead of making attempts at operative relief."

In a recent series of 300 cases, operated upon by Péan, in which removal of the growth through the vagina had been done (with 98 per cent. of success), the tumor had been recognized for periods varying between six months and twenty years, and a large proportion of the women had wasted their pecuniary resources in thermal and medical treatments, curettings, electric applications, massage or incomplete operations, such as the removal of one or two fibromata or a removal of ovaries and tubes. In some of these cases sarcomatous degeneration of the fibromata was found, in others epitheliomata coexisted; still others showed a cancerous ovarian disease. Besides these were many other complications, especially during pregnancy. Fibromata do, it is true, occur in virgins, which proves that pregnancy is not necessary for their development; but in many cases they cause various disorders of the genital system—vulvo-vaginismus, abortions, still-births, tubal pregnancies, not to speak of the modifications of the uterine coats due to the presence of the tumor, nor the dangers to mother and child which their presence causes, and which are dwelt upon at length in obstetrical works.

Uterine displacements are also common with dysmenorrhœa and other menstrual disorders as results. The uterus, ovaries, tubes and ligaments, too, are frequently the seat of grave inflammatory affections. Peritonitis, acute or subacute, had existed in a large number. Many similar cases and complications are given. The extreme views held by this noted surgeon may be given in his own words: "Fibromata of the body of the uterus, even when they are not very large, are dangerous tumors, frequently giving rise to dangerous complications. They ought to be operated upon as soon as they are recognized. The early removal of these tumors is attended with less danger than when the operation is deferred until a later period."

A series of papers were read at this session dealing with the various operations for the relief of patients suffering from various degrees of uterine fibro-myomata, and the indications for each were discussed at some length. BOUILLY (Paris), in a long paper upon the value of the removal of ovaries and tubes, says: "The treatment by the removal of the tumor directly seems most in favor, but, notwithstanding the perfection which the operative technique has reached, there is still danger. Conditions may also exist where the indirect treatment by tubo-ovarian castration is to be preferred.

The main indications for this are:

(1) Hæmorrhages, menorrhagic in character, with the usual menstrual flow prolonged, or dangerously increased, or with abnormal frequency, but still regular.

(2) Severe pain, either constant or paroxysmal, especially pain increased during menstruation.

(3) The operation is to be preferred when, owing to anæmia or cachexia, the woman is too feeble to stand the shock of the more prolonged and difficult operations.

In this class of selected cases the consensus of opinion was that the removal of ovaries and tubes gave extremely satisfactory results.

Vaginal hysterectomy, where the tumor had not attained great

size, or abdominal hysterectomy, where the tumor was at the fundus and of large size, are the preferable operations in other classes of fibromata. The results of many cases in the hands of the eminent surgeons present support these views.

In view of the furore excited a few years ago by the use of electricity in such cases by Apostoli, in Paris, by Englemann, in St. Louis, and their followers, the report read by BERGONIÉ and ANDRÉ BOURSIER of the results attained in 100 recent cases treated at the electro-therapeutic clinic, at Bordeaux, is interesting. The observations cover a period of eight years. The number of cases observed was more than 200. About 100 of these have not been included in this report as incomplete, or for other reasons. The treatment has been applied solely to cases where the uterus was myomatous, or to fibrous uterine tumors. Cysto-fibromata, fibrous polypi, or sub-peritoneal pediculated fibromata have not been included.

*Technique.*—The positive monopolar method is used; the carbon hysterometer connected with the positive pole introduced into uterus; large abdominal electrode negative. The current varied from 25 m A. to 150 m A.; the time of application has been ten minutes; antiseptis secured by the use of 1-4000 sublimate solution.

Results: In 100 cases fifty-four were of large fibromata; seven of these showed marked diminution in size; ninety of the cases were marked by hæmorrhages; in eighty-one of these this symptom has either ceased or has been improved by treatment; forty-one cases suffered much pain; in twenty-two of these the pain has diminished or has stopped. In sixty-three cases the general health has been improved. These facts show that: (a) Electric treatment given in this manner is especially efficacious in hæmorrhagic fibromata (90 per cent.); (b) that the general health is improved (79 per cent.); (c) pain is frequently relieved under its influence (50 per cent.); (d) that it rarely causes diminution in the size of the tumor (10 per cent.).

Among the various changes in technique which were advanced *the method of treating the uterine pedicle* advocated by CHAPUT (Paris) deserves mention.

“The treatment of the pedicle consists in three distinct steps:

“(1) Checking hæmorrhage.

“(2) Disinfection of the uterine canal.

“(3) The fixation of the pedicle behind the abdominal wall.

“The tumor is exposed, the broad ligaments cut between clamps and a rubber ligature passed around the base of the tumor and clamped fast. The tumor is cut off an inch or so above this ligature, and the pedicle held in view by heavy clamps placed behind it. I have made the interesting observation that the arteries of the pedicle are seated nearly always close to the periphery. A row of wide convex-toothed clamps are placed around the free edge, and the bleeding is practically checked. The pedicle is treated just like a stump after an amputation. The relaxing of the rubber permits bleeding points to be seen and noted, and the rubber is again made fast. About each vessel the surgeon makes a rectangular incision about 1 cm. deep. The prism of tissue thus made, and which contains a vessel in its centre, is then seized with heavy, broad clamps, drawn out and ligated with heavy silk.

“When the central vessels are all tied the peripheral vessels are tied similarly by cutting on either side of the clamp longitudinally, so that a bit of uterine tissue containing the vessel is liberated. This is tied with silk as above.

“(2) One should not proceed to the disinfection of the canal until after the rubber ligature is removed. Then the thermo-cautery is used thoroughly on the walls, followed by tincture of iodine applied on small cotton tampons. Then a 10 per cent. chloride of zinc solution is used, and finally a strip of iodoform gauze extending freely into the vagina, but cut close on the peritoneal side of the pedicle.

“The entire surface of the pedicle is then well painted with tincture of iodine.

“(3) The last step in the operation consists in passing a ligature across and through the pedicle behind, and the two ends then are used to suture through the abdominal wall. At the lower end of the



abdominal incision a strip of iodoform gauze is placed reaching down to the pedicle.

"This fixation behind the parieties has many advantages. In the first place it prevents the pedicle from falling back, and possibly causing intestinal obstruction (Treub). Secondly, it adheres quickly to the wall, and if infection occurs through the vagina it is rapidly shut off by adhesions, and the pus drained away by means of the iodoform gauze. Finally, in case of bleeding the iodoform gauze acts as a hæmostatic.

"The operation is simple, quickly and easily performed, and gives the greatest chance for recovery."

#### RICHELOT ON THE OPERATIVE TECHNIQUE OF VAGINAL HYSTERECTOMY.

IN the June and July numbers of the *Archives Générales de Médecine* G. RICHELOT (Professeur agrégé à la Faculté, Chirurgien de l'Hôpital Saint-Louis), writes upon the "Operative Technique of Vaginal Hysterectomy." M. Richelot bases his article upon the personal experience acquired in 225 operations of this nature, in which he had eleven deaths, operations made, as the writer says, "under the most varied and dangerous conditions, having never declined to operate when there seemed a chance of recovery for the patient." He is thus able, in describing his personal method, to present all phases of the operation.

Few instruments are necessary, and these are very simple. Assorted sizes of retractors, from 6 to 12 cm. long ( $2\frac{1}{2}$  to 4 inches) and 2 to 4 cm. wide ( $\frac{3}{4}$  to  $1\frac{1}{2}$  inches); long and short straight bistouries; long uterine scissors curved on the flat; several toothed, straight and curved traction forceps; a score of ordinary artery clamps, and a dozen somewhat longer ( $6\frac{1}{2}$  inches) hæmostatic clamps, eight of them with straight blades and four with curved ones. These are for the broad ligaments. Two or four straight bladed ones are frequently sufficient; the others may be needed temporarily. The curved ones

are rarely used. The jaws are 6 cm. or more long ( $2\frac{1}{2}$  inches), and the handles 10 to 11 cm. (4 to  $4\frac{1}{2}$  inches). Some may have shorter jaws, thus securing greater firmness of grasp. Sponges, iodoform gauze, needles, silk and silk-worm gut should be in readiness in case the bladder should be wounded. The dorsal position of the woman is greatly to be preferred.

The author says: "I have three different operations to describe for the three conditions of the uterus which may require vaginal hysterectomy.

"1. Movable uteruses. These include localized cancer, certain forms of prolapse, or of metritis, which resist treatment; rarely a case of neuralgia of the uterus.

"2. Adherent uteruses with lesions of the adnexa, or with pelvic suppuration.

"3. Uterine fibroids where the seat and number of the tumors render a total extirpation necessary, and where the mass is not so large as to prevent removal in this way.

"Vaginal hysterectomy, as applied to movable uteruses has been fully worked out, but the other operations are new, and the surgeon who attempts them is obliged to acquire a second education; they differ markedly from their predecessor. With the first operation hæmostasis by means of clamps is the method of choice; with the other two the difficulties are increased and forcipressure is no longer optional; it is absolutely essential in the 'hysterectomie par morcellement.' "

(a) *Where the Uterus is Movable.*—The posterior retractor being in place, and the anterior lip of the cervix seized and drawn down as far as possible, a circular incision *in the vaginal insertion* is marked by a bistoury, and deepened by means of curved scissors. It is necessary to work carefully as far as to the uterine tissue; then, to free the anterior surface of the organ, the vaginal tissue is pushed carefully away, cutting with the scissors such vagino-uterine muscular fibres as may be necessary. When all the fibres of attachment are loosened the finger can easily work its way through the cellular

tissue, using the scissors, however, and cutting close to the uterus whenever there is the least resistance. The detached tissue forms a roll above the retractor. The bladder is already far distant; by hugging closely the uterus the integrity of its wall is never placed in jeopardy.

Behind all is easy; the rectum is some distance away, and the index finger is soon able to work on into the base of Douglas' cul-de-sac.

At the sides the mistake is often made of not enlarging the first incision for fear of cutting the broad ligaments. It is really better to cut with scissors the vaginal insertion, and even a tenth of an inch of the ligament proper—the uterus descends better. But it would be bad to go too far, and to be obliged to clamp thus early some branch of the uterine artery.

No hæmostasis is needed; there is but little bleeding, and this usually ceases spontaneously. There is, however, a small vessel in front of the cervix to the right and to the left which may bleed enough to require a clamp for a few minutes.

Thus far a posterior retractor is all that has been necessary. As that is broad the vagina is opened sufficiently to obviate the use of an anterior blade, the finger sufficing to prevent the vaginal wall from falling. One can continue in this manner with a loose vagina and a yielding uterus. If, however, so little vaginal tonicity, or shortness of the ligaments, offer resistance it is better now to dispense entirely with retractors; a finger alone at the level of the commissure, and moderate traction causes the uterus to descend in proportion to the thoroughness with which the surfaces have been cleared; it is a true enucleation. Already the broad ligaments, now very oblique, are collected in two very large cords at the angles.

In cases of movable uterus the descent is favored by the absence of retractors. The retractor is only needed at the beginning of the operation to expose the cervix and to make the primary circular incision. There need be no anxiety to seek the anterior cul-de-sac. Care should be had not to cut until the peritoneal membrane is

plainly visible. The separation of the tissues should be continued until there is seen closely applied to the anterior uterine wall the bottom of the cul-de-sac, as a thin glistening membrane. The pressure of the finger usually suffices to divide the serous coat, or better a snip with the scissors. Behind, the curved scissors, working upward and keeping close to the uterus, quickly reaches the peritonæum, and pierces it without further trouble; two fingers enlarge the opening.

The uterus is still held by the broad ligaments, which it is necessary to treat next. For a long time Richelot has used a method of inversion from behind at this stage. Placing the first and second fingers of the left hand in the place of the posterior retractor, he works them as far up in Douglas' cul-de-sac as possible, and makes sure that a coil of intestine will not prevent the manœuvre. Being satisfied of this, he seizes the posterior uterine wall with toothed forceps, and, making traction, uses his fingers at the same time to depress the fundus. A second forcep, if necessary, is applied higher up, and soon the uterine body is quite inverted. The cervix has meanwhile been held by traction forceps, so that the uterus is folded upon itself, fundus and cervix lying side by side in the vagina, thus preventing mucous discharges from entering the peritoneal cavity.

This manœuvre has compressed and narrowed the broad ligaments. The index finger, still in the posterior opening, is slipped to the right and hooks over the inverted ligament, its tip appearing in the utero-vesical cul-de-sac, which is now opened, if it has not been done before. Then taking a long pair of clamps, he introduces them from *above downward, i.e.*, from the base of the broad ligament to its superior border. With the forceps, jaws 6 cm. ( $2\frac{1}{2}$  inches) long, the edge is easily included, and using the finger as a guide the forceps are turned a little to the right in order not to include the uterine wall. The tissue on the uterine side of the forceps is then cut free with the scissors. The left side is treated in the same way and more easily; a final cut of the scissors ends the operation.

If the clamp is too short to include the superior border, it is

easy to place a secondary clamp on a level with the uterine cornu before cutting the uterus free.

If this inversion seems difficult because of the size of the organ, the clamping process can be done in successive stages. The partial enucleation being finished and the peritonæum opened, it is necessary to seize the base of each ligament, the bite being close to the side of the uterus on account of the ureter; the tissue to the height of the clamp having been cut and the uterus drawn down, a second clamp is applied so as to include the free border of the ligament, which is drawn down by the finger. In case the uterus is so large that the second clamp does not suffice, one can do the *morcellement* operation next to be described. This operation is very short. The extirpation of the uterus proper lasts from five to ten minutes. That is the end of the operation proper. The additional hæmostasis, and the careful placing of tampons, prolongs the whole to twenty or twenty-five minutes.

The patient is put to bed; the clamps are supported by a roll of gauze about them; the legs are slightly flexed. For forty-eight hours she is catheterized regularly. Morphine is given if indicated.

On the third day the clamps are removed carefully, without disarranging the tampons. These remain in place for a week. At the end of two or three weeks the patient is able to be up and about, and in two months the vagina is quite healed.

(*b*) *Cases in which the Uterus is Adherent.*—There are some uteruses firmly fixed high in the pelvic cavity, and which descend but slightly on traction; others are somewhat better in this respect, but are deflected, retroverted, or the cervix is concealed. Some, notwithstanding the extent of their lesions, are movable, but owing to the narrow passage are prevented from descent, and must be operated upon as they lie.

The loosening of the inferior section is always made in the same way as just described, but it takes longer, is more difficult, and an anterior retractor plays an important rôle. The assistant stands at the operator's right, and holds it obliquely upon the anterior surface

of the uterus. (If too horizontal, its end may press upon the bladder, and its base obscure the field; if too vertical, it encroaches too much on the passage, and interferes with the use of the scissors.)

If by this means the peritoneal cul-de-sac is quickly reached and opened, the blade of the retractor is placed in it, and the assistant no longer has the care of looking out for the bladder. Usually, the peritonæum is not opened till later during the *morcellement*. It is necessary to stop in this separation of the bladder when the finger, working in the cellular tissue, perceives that the two folds of the broad ligaments must be divided in order to draw down the uterus.

Behind, the broad and short retractor is held firmly by an assistant at the left, who depresses the commissure. A long blade is occasionally needed to depress the posterior fornix and raise the uterus; the finger usually is able to do this, and so clear the way toward the uterine arteries, for to secure these all of the first efforts in operations of *morcellement* are directed.

The finger glides from the uterus toward the base of the broad ligament, penetrates it, separates the anterior layer of the peritonæum, and with it the ureter which is near by. Then passing behind, the posterior layer is pushed back, and thus the bundle of vessels is freed, which one can then seize between the two fingers. The index finger placed before the artery feels its pulsations, and so is able to direct the blades of a long clamp which is now applied, and which bites the broad ligament about 1 cm. ( $\frac{1}{2}$  inch) from the cervix. A bite 3 cm. ( $1\frac{1}{4}$  inches) thick makes hæmostasis certain, and prevents further care for the ureter. A stroke of the scissors at the right and left along the forceps blades, and the inferior segment is free.

It is here that the method of operation changes according as one has to deal with enlarged and thickened adnexa, or with pockets of pus. In the first condition mentioned, we have to operate upon a case in which the uterus is large, congested, with a mass upon either side formed by enlarged ovaries and tubes; peritoneal adhesions behind frequently obliterate the cul-de-sac of Douglas. The tubes



are rarely sufficiently large to come in front of the uterus, so this space is free; the removal of such a mass involves the opening of the peritoneal cavity.

In order to disengage the uterus it is necessary to cut piecemeal from below upward, reaching little by little the cornua. These are then drawn toward the median line. A pedicle made for each by means of long clamps, and then each separated from the adnexa by cutting away with the scissors. The ovaries and tubes are left until the removal of the uterus gives free access to them.

Here are the rules for *morcellement*: With the scissors divide the cervix into an anterior and a posterior half. Make this cut deep; then depress the posterior lip, and cut obliquely from below upward, so as to remove at one stroke a large, long piece of tissue. Now, if you grasp the anterior lip and draw it toward you, the uterine globe will commence to roll toward you on its vesical aspect, owing to the free space which you have just made behind it. While drawing the mass downward the scissors denude it, and the anterior retractor continues to bring it nearer; you gain ground already. Now attack the remaining lip and cut it across, taking care, however, before severing it completely, to grasp the mass above with strong toothed forceps, to prevent its slipping up out of reach.

Still holding the anterior edge of the remainder, you strive to cause this to invert itself forward, and the pressure of the retractor, collecting the vessels, obliges you to cut with your scissors a thin lamella of cellular tissue leading to the peritonæum. If the uterus is yielding, you may make one or two more transverse cuts, treating the lips thus formed as before. Soon the serous membrane is seen at the fundus of the uterus.

Suppose, however, that the uterus descends with difficulty and prevents further transverse incisions, and that the mass affords a bad hold, or even slips from the forceps and escapes above the retractor. Prevent such an accident by placing two forceps at left and right, cut the uterus away piecemeal from below upward, changing the forceps from time to time, and work up to the peritonæum. Having

reached this, place the retractor in this new position. The bladder is now protected, and you can work more rapidly. The removal of the central mass is easily accomplished; the cornua approach one another and descend in the form of a V. The cornua are then clamped separately, and the balance of the uterus cut away. Four long clamps are absolutely essential to secure hæmostasis, and frequently supplementary ones need to be used should one or two arteries slip from the grasp of the primary clamps.

The lateral masses formed by the ovaries and tubes demand treatment next. The two retractors, always in the same position, suffice to open the field to view, and the clamps already in place make excellent tractors. Traction is made on one side, the strength of the adhesions ascertained; the finger is introduced, and feels the ovary tube; a clamp is put above them, or, better still, seizing the cornua and the adnexa with the finger, a new clamp is applied above them, and they are cut off. Such are the simple cases.

In other cases the tubo-ovarian mass is seated high up and strongly adherent. The finger does not reach it well, and traction accomplishes nothing. What is to be done? Do *not* introduce the entire hand, as is sometimes advised. With a little patience the result can be attained without this brutal manoeuvre. Draw strongly on the cornua, and explore as well as possible with the index and middle fingers. The tube, omentum or intestine can be differentiated by touch. The angle of juncture is found by careful searching, and pressure makes the parts descend slightly. The tip of the tube appears; it is seized, worked loose, and little by little, just as in a difficult laparotomy, the tubes worked loose. Sometimes the use of ordinary clamps or forceps, with fenestrated blades, may be of assistance in the early stages of operation.

More difficult still are those cases in which fibrous processes exist, invading the pelvis, surrounding ovaries and tubes, which may themselves be sclerotic and strongly adherent behind the broad ligament. An operator soon learns what a task such conditions impose upon him. In such cases the removal of one ovary and tube may be

effected; in others, both sides must be left, and merely a "uterine castration" done. The mere removal of the uterus in such cases usually causes atrophy of the adnexa, and so effects a cure.

Cases of hydrosalpinx require no special manipulation, though sometimes it is better to protect the peritoneal cavity with sponges, and then open them in sight before making traction upon them, thus preventing their unexpected rupture.

In cases when *pyosalpinx* or *pus pockets* add new dangers to the operation, sometimes the uterus is removed *morcellement*; the tubes appear red and congested like two serpents. These two movable masses are sometimes removed easily, or perhaps a cystic ovary and a pus tube may appear. In all these cases this pus should first be evacuated, but carefully to avoid peritoneal infection; one or two sponges on holders are placed by the side of the mass and above it. Then the sac is opened with a bistoury and kept from closing with toothed forceps. When the pus has all escaped, the cavities should be irrigated with sublimate. The tubes are then carefully removed with the fingers and forceps.

In case a pus pocket is accidentally opened into during the operation, the opening should be enlarged and all the pus allowed to escape that will, followed by thorough irrigation. This course should also be pursued with the multiple pockets shut off by adhesions which sometimes occur. In such cases the application of clamps should be made with extreme care, as the tissues are friable and often bleed easily. Such cases of multiple foci of suppuration demand the greatest care and patience. Where the extirpation of all the pus pockets is impossible, the chief care of the surgeon is to afford each a free exit and to irrigate them freely. In some cases, even though very rarely, the pelvis may be so completely filled with adhesions as to render the operation an impossibility.

The pus cavities thoroughly irrigated are packed lightly with strips of iodoform gauze, and the usual vaginal tampons are inserted. The gauze is removed from time to time and cleanliness maintained. This comprises the substance of the after treatment.

(c) *Uterine Fibromata*.—The extirpation of such tumors follows the rules already given, and merely a few new suggestions can be given under this head.

The fibrous uteruses which should be removed *per vaginam* are those which, instead of containing a single submucous tumor, which can of itself be enucleated, contain one or more tumors in their walls which can only be relieved by removing the organ itself. At the same time they must not be too large. Mere size, however, is not the only criterion. The position occupied by the tumor, and the ease with which it can be reached, are also important.

The operation begins as already described. Even when the cervix is effaced by hypertrophy of one of the lips, or is hidden behind the symphysis, one can always seize it and bring it to view, gently far enough to make the circular incision, separate it little by little from the vaginal walls, separate the base of the broad ligament, and clamp the uterine arteries at any rate. Richelot has done this in thirty-two cases of hysterectomy for fibroids. The uterine artery, whatever may be the size of the tumor, always bears the same relation to the cervix, and is always to be found by the same manipulation. It is always a good plan to commence by securing it, as the hæmostasis is then done for the rest of the operation. It should be remembered always that there often exist in such fibroid uteruses large and dilated branches of the uterine artery, which may be as important as the main vessel. It may be necessary to clamp these before proceeding to remove the tumor.

The ureter is thus preserved in its normal relations, and is no longer endangered by subsequent manipulation. It may sometimes be distorted by the presence of a fibroid in the lower segment, in which case one can cut away the fibroid from the middle toward the periphery.

The field of operation being dried, it is necessary to work toward the sacs containing the fibromata. Open the cervix widely by the bilateral incision, cut away the uterine tissue, which forms an obstacle. From now on there are some modifications in the operation necessary.

The anterior retractor has a difficult rôle to play, since the peritoneal reflection is higher than usual and is opened later. The irregularities of the tumor, too, can hinder progress and even prevent one from reaching the fundus when the peritonæum is reached. Small fibromata are frequently met with in the course of the operation; these can be gently removed, and usually can be drawn out with a pair of forceps. The right and left of the tumor can be grasped with strong forceps, and then bit by bit with long handled bistoury, or with scissors, the mass can be removed till finally the cornua can be drawn together and treated as before. Often, if the uterus is very large and globular, the greatest patience is necessary, as it is smooth, hard and slippery, and unless care be taken may slip away from the grasp. Extra and unexpected tumors may come to view, and the operation may be extended to two or three hours.

The ovaries and tubes should be treated as may be necessary, and the same rules hold as now given in the preceding section.

The results of these operations, often long and sometimes frightful to behold, the author claims to be surprisingly good and the reaction slight or entirely wanting, the patient usually having little pain and scarcely any rise of temperature.

H. P. DE FOREST.

#### SUGGESTIONS FOR EFFECTING SPHINCTERPLASTY AFTER AMPUTATION OF THE RECTUM.

CH. WILLEMS,<sup>1</sup> of Ghent, following von Hacker's idea of making the abdominal opening of a colostomy through the separated fibres of the rectus abdominis, in order that the patient may have a voluntary control over the bowel movements, has applied the same principle to the amputated rectum, using as the muscle of voluntary control the gluteus maximus. He proceeds as follows: When the amputation is not done especially high it not is difficult to draw

<sup>1</sup> Centbl. f. Chirg., May 13, 1893.

the stump well down into the wound. When this is done an incision 5 or 6 cm. long is made through the skin above the tuber ischii, passing upward and outward. This incision runs parallel with the fibres of the gluteus maximus, which can be felt with the finger in the extirpation wound. The muscle fibres are next separated by blunt dissection, making an opening about 2 cm. from the lower edge of the muscle. Through this chink the end of the gut is dragged and sutured to the skin.

If the amputation has been done higher, and it is impossible to bring the bowel down to this point, the opening through the muscle can be made higher up, in fact, through any fibres inserted into the edge of the sacrum. The operation has thus far not been performed upon the living subject, but has been practiced only on the cadaver.

R. GERSUNY,<sup>1</sup> of Vienna, has performed his new operation upon two cases of carcinoma of the rectum, in which the sphincter ani could not be preserved, although in both cases, after the diseased portion had been removed, the stump of the rectum could be drawn down to the skin surface. His operation consists in placing two clamps diametrically opposite to one another on the free end of the stump of the rectum. With these clamps he now twists the gut on its long axis until the finger to be introduced into the lumen of the intestine has to pass considerable elastic resistance. The gut so twisted is then sutured by its free end to the skin.

In both cases the wounds healed rapidly, and without the sutures giving way. During their stay in the hospital the first patient had no incontinence; the second was at first unable to control watery stools, but later regained a satisfactory continence.

Soon before they were discharged from the hospital examination showed a different condition from that immediately after the operation. At first it could be felt that the longitudinally folded gut, from below upward, gradually narrowed like a funnel; but the last examination showed a prominent annular constriction, from 2 to 3 cm.

<sup>1</sup> *Centbl. f. Chirg.*, July 1, 1893.



above the external anal opening. This ring gave to the finger very much the same sensation as the normal sphincter ani. The rectum below this ring was cylindrical, and immediately above it the lumen of the gut was normal in measurement.

The one patient reported at the end of sixteen days after leaving the hospital, that he had perfect control over the bowel; the other reported, at the end of eleven weeks, that the function was entirely normal.

In the first case the torsion was carried to  $180^{\circ}$ ; in the second it was carried to  $270^{\circ}$ . The bowels were moved on the fifth and sixth days respectively. Drainage was employed in both cases, and the wounds closed.

The mechanism of this narrowing of the lumen is accomplished simply by means of the torsion; and the extent to which it is carried must be governed by the finger introduced in the bowel. The operation is applicable not only to amputatio recti, but to every artificial anus; and also in cases in which an artificial anus has been made, and in which incontinence exists, the gut may be freed, twisted and again sutured to the surface opening.

JAMES P. WARBASSE.

## INDEX OF SURGICAL PROGRESS.

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### CHEST AND ABDOMEN.

#### **I. A Case of Pneumonectomy.** By D. LOWSON (Hull).

The patient, a female aged thirty-four, presented herself with the following history :

She had been married thirteen years, but had no children. She had suffered for fifteen years from dyspepsia, but for twelve months had much pain over the top of the right lung, striking through to the back, and had lost much flesh. She frequently perspired at night, and often found herself bathed in perspiration in the morning. She had a short cough, but no hæmoptysis. The pulse was quickened, averaging 112, and the temperature in the evening was frequently 2° to 3° above normal.

There was distinct retraction below the right clavicle when compared with the left side. Dulness was also marked as far as the second space, and the voice sounds were much more loudly conducted on the affected side. The exaggeration of the vocal fremitus was very distinct when the two sides were compared. The family history was good. She herself had been a weakly girl, and had suffered from a suppurating gland on the right side of the neck. She was under observation for six months, and during that time the symptoms became gradually worse. The loss of flesh was manifest, and the cough and perspirations continued to trouble her, though there was little expectoration and never any hæmoptysis.

Lowson came to the conclusion that, as far as one could judge by physical signs, the disease was probably confined to the right apex. The patient, also, though evidently losing ground, was not very ill. She, therefore, was a case suitable for operation, if a case

could be. In addition, she was in poor circumstances, and could not afford the luxury of a change of climate.

An incision was made from mid-sternum along the course of the second rib, through the pectoral muscle nearly to the edge of the anterior axillary fold. From the inner end of this an incision was carried for a couple of inches downward along the middle of the sternum. The skin and muscle were then reflected from the surface of the second and third ribs, and a number of vessels spouted and were secured—mainly branches of the acromio-thoracic and intercostals. The external intercostal muscles were next separated above and below from the two ribs, and with a periosteal elevator the pleura was detached and stripped off from the inner side. With a fine saw the ribs were divided, through the cartilage internally and through the bone externally near the outer angle of the incision. Pinching up the pleura a trocar was pushed in, the cannula of which was connected by tubing with a Junker's bottle and bellows, and air, which was passed through a hot strong solution of carbolic acid, was slowly pumped into the pleural cavity. The lung could be partially seen sinking slowly from the chest wall, but no dyspnoea or cyanosis followed. The external layer of the pleura was next laid open the length of the external incision, and the lung found completely collapsed and moving up and down rhythmically with the diaphragm.

There were extensive adhesions along the face of the upper lobe, which took a considerable time to tear through, but gradually, and with patience, a complete separation was effected. There remained high up two finger-like ligamentous processes, attaching the apex to the summit of the extension into the neck. These were easily broken and the apex drawn out. The diseased part was seen occupying the anterior part of the apex. A large needle in a handle, rounded and without edge, and with an eye big enough to take in a large twisted silk thread, which had been boiled and had long lain soaking in an ethereal solution of iodoform, was employed. With this needle the lung was transfixed some distance below the disease, tied firmly in two pieces, after the Staffordshire method, and the upper diseased

portion cut off. The portion removed was the size of half a fist, and contained a dense tuberculous mass with discrete granulations around it. Into the stump iodoform powder was rubbed, the cavity was sponged out and the mutilated lung dropped back. In the course of the operation the whole organ was palpated for other collections, but nothing was found except soft spongy lung tissue. The author was struck by the ease with which a living lung can be palpated. The fingers seem to almost meet, even when the thickest portions are grasped, nor do they seem so voluminous as in necropsies. The external incision was closed without draining. At no time did the respiration get troublesome, so that neither the oxygen nor electric apparatus was wanted. The evening temperature was  $99^{\circ}$  and pulse 84; respirations, 36.

For the next three days matters went on in a similar way, and all seemed going on well. On the night of the fourth day, however, there was a sudden development of a limited patch of dry pleurisy on the left side (opposite) which gave her much pain and greatly crippled the respiration, which increased in frequency to 46 per minute. The pulse also went up to 108, but the temperature stood at  $99.6^{\circ}$ . The trouble gradually disappeared, and the respirations fell to 28.

The next difficulty rose at the end of the second week, when the temperature began to rise, every night going up until it reached  $101.6^{\circ}$ . It seemed like a fresh eruption of tubercle. The breathing became a little quicker (32), but the pulse was quiet (88 to 96). There was some dulness posteriorly, and, as some black blood had appeared at the outer angle of the wound on the fourth day, the author came to the conclusion that there was blood in the pleura, and it was this that was causing the rise of temperature, just as in cases of hæmatocele of the broad ligament.

The temperature kept up until a month after the operation, when there was a sudden discharge of a large quantity of brown looking matter of the color of chocolate, evidently altered blood. The temperature now dropped to normal, and respirations to 24. The

hæmothorax now became an empyema. The brown color gradually changed to yellow, but at the same time the quantity diminished very much, and remained perfectly sweet. At the present time the amount drawn is not quite an ounce. The patient is thin, but is taking her food well and has been up on several occasions. The temperature has been normal for a long time, and the respirations averaged 22. On the left side only healthy signs are discoverable; on the right side clearness posteriorly, except in the upper scapular region, and in front clear below and hyper-resonant on gentle percussion over the part where the ribs were excised. Air seems to enter the lung well in the lower parts, and ordinary respiratory sounds are also heard in the suprascapular fossa. In the subclavicular fossa are the sounds produced by the air entering the small opening in the chest wall.

The author regrets that he did not introduce a drainage tube at the beginning. This, he thinks, would have hastened very much the ultimate healing.

The patient has steadily gained flesh and strength, and at the time of writing was up and about and preparing to return to her home.—*British Medical Journal*, June 3, 1893.

JAMES P. WARBASSE (Brooklyn).

**II. Hernia of the Vermiform Appendix; a Report of Forty-one Cases.** By Dr. BRIEGER (Breslau). The author presents a series of forty-one cases: In twenty cases it was of the inguinal variety; in fifteen cases the femoral; in six cases the variety was not stated. In twenty-three cases the appendix was incarcerated; in seven it was reducible, and in eleven the condition was not stated. In only eight cases was the appendix normal. Operation was performed in twenty-six cases; sixteen cases were entirely cured; two were cured, but had a fistulous opening; five died; in three cases the result was not stated.

As the study of the cases had advanced, the prognosis, which was formerly unfavorable, has of late become much more favorable.

From a careful study of these cases, he draws the following conclusions:

1. Hernia of the vermiform appendix is more frequent than is generally accepted.

2. It is impossible to diagnose with certainty a hernia of the vermiform appendix. When there are present the symptoms of an incarcerated hernia in the right inguinal or femoral regions, one should think of the possibility also of an incarcerated hernia of the appendix.

3. A hernia of the appendix may produce more or less severe complications inasmuch as the vermiform appendix is so frequently the seat of pathological processes.

4. This variety of hernia demands an early operative interference, because of the threatened complications which may arise from the appendix.

5. This operation, almost without exception, must consist in the resection of the vermiform appendix. The method of Mikulicz is the best employed for the closure of the stump. The appendix must not be returned unless absolutely normal.—*Archiv für klinische Chirurgie*, Band XLV, Heft 4.

### III. Gangrene in Strangulated Hernia; Resection versus Anus Præternaturalis; Conclusions from 576 Cases.

By H. P. ZEIDLER (St. Petersburg). This subject has been treated in an exhaustive manner by this thorough and uncommonly diligent writer. The paper embraces the histories of 289 cases in which primary resection was performed for strangulated hernia, and 287 cases in which the anus præternaturalis was made. In the first group 142 (49.13 per cent.) died, and in the second group 213 (74.22 per cent.); that is, an increase in the mortality of 25 per cent. The explanation of these numbers becomes clearer when the special cause of death is understood.

From the first series 20 cases, and from the second series 74 cases are excluded, because the definite cause of death was not stated.



	Resection.	Anus Præternaturalis.
Detailed cases . . . . .	269	213
Fatal cases . . . . .	122	139
	Per Cent.	Per Cent.
(a) From accidental causes . . . . .	6.32	3.76
(b) From peritonitis and collapse which existed before the operation . . . . .	19.33	24.88
(c) From secondary infection and peritonitis . .	15.95	20.66
(d) From other complications in connection with the operation. Narrowing of the lumen of the intestine. Exhaustion and in- anition . . . . .	2.60	11.77
(e) In consequence of subsequent operations . .	1.11	4.22

## SUMMARY.

(1) Independent of the operation <i>a b</i> . . . . .	25.65	28.64
(2) Due to the operation <i>c d e</i> . . . . .	19.66	36.65

Although the number which were hopeless from the first is 5.55 per cent. (24.88 against 19.33), greater in the second series, still the fact remains that through the choice of the anus præternaturalis, 17 per cent. of the cases died which might have been saved with more or less probability had the primary resection been performed.

Indeed, in the formation of the anus præternaturalis nearly all the dangers exist which are present in the primary resection, and, also, in addition, certain dangers and disadvantages which are absent from the latter. The only advantages of the anus præternaturalis are the shortness of the operation and the rapid and complete emptying of the intestine. These can be made of use temporarily, since Riedel has shown that the anus præternaturalis can be closed after a day or so by an early secondary resection, namely, in such cases where the primary resection is contra-indicated, either on account of the severe collapse, or on account of the impossibility of placing the sutures in entirely sound tissues, in those cases where the limits of the gangrene are not absolutely determined. The anus præternaturalis, as an exclusive treatment of gangrenous hernia, should be given up.

A contra-indication to primary resection is the presence of a diffuse peritonitis, especially when combined with collapse. If collapse is absent, the resection is not absolutely contra-indicated, but it should not be followed by a radical operation.

According to the histories of these above-mentioned cases, perforation of the intestine, infection of the sac, and phlegmon of the adjacent tissues have not proved to contra-indicate primary resection. The greatest danger and the most frequent cause of death is secondary gangrene of the sutured intestine. As one may resect a length of intestine, averaging up to 20 cm., without harm to the patient, so one should resect entirely in sound tissues. To aid this purpose the strangulated intestine may be drawn out as far as necessary after the abdominal wound is enlarged.

When the intestine is over-filled, it must be emptied before the sutures are passed.

If one is not sure about the limits of the gangrene, then the anus *præternaturalis* must be made. This may be followed by an early secondary resection.

The next most frequent cause of death after resection is the peritonitis, due to an infection from the sac. This danger can be lessened by careful disinfection of the sac before opening it; by closure of the abdominal opening during the manipulation of the strangulated intestine; by closure of the open ends of the intestine during the resection; by careful disinfection of the sutured intestine before its reposition; by tamponading the outer wound; by fixation of the sutured intestine and in surrounding the seat of the suture with tampons, etc. This last is of advantage in conducting away the *faeces* in case the sutures do not hold.

One must especially guard against any gangrene of the edges of the intestine. In a few cases the technique of the sutures may be responsible for this accident. Only in exceptional cases does a contraction of the intestine, at the seat of the sutures, lead to complete obstruction and death.

The temporary closure of the intestinal lumen during the opera-

tion may be accomplished by different methods, no one of which has any marked superiority above the others. That portion of the mesentery which belongs to the resected intestine should be cut away, and the corresponding edges must be carefully approximated and sutured.

The choice of the method of suture is not so essential, presupposing the principle of Lembert is understood.

The selection of the material for suture is not of special importance, but it is of the greatest importance that these sutures be passed in absolutely healthy tissues. After suturing, the intestine is to be replaced in all cases.

The radical operation can be completed only when there is no peritonitis and the sutures are in absolutely healthy tissues. If there be the least doubt, then the intestine should be fixed in the abdominal wound and protected by tampons. In all cases where the radical operation is not performed, the abdominal wound should be thus treated.

During the first few days after the operation the diet must be limited and opium given as is necessary.—*Centralblatt für Chirurgie*, January 21, 1893, p. 62.

JOHN B. WALKER (New York).

#### GENITO-URINARY ORGANS.

**I. Thirty-two Cases of Operation for Tumors of the Urinary Bladder.** By E. H. FENWICK, F.R.C.S. (London). Fenwick has operated thirty-two times with a definite object of removing tumors which had been diagnosed as being present. The first case proved a mistaken diagnosis, for the tumor was merely a small papillomatous-like tag coexisting with tuberculous disease. In another, a female case, he deemed it best to leave the tumor alone, but, probably with increased experience and better methods of removal, he states that he should not again hesitate to dissect a similar growth away. It proved to be a very dense epitheliomatous ulcer. On thirty occasions he removed tumors. The perineal operation was performed three times, because the growth was near the urethral ori-

fice, the female urethra was dilated in eight instances, and the suprapubic route was chosen nineteen times. There were two deaths as the direct result of the operation. Both patients were males; both were the subject of a small but pure villous papilloma. The operation was easy in both cases, but both cases died of suppression. Both had had epidemic influenza three or four days before the operation.

One carcinoma recurred three months after a very thorough removal. Four other cases have recurred, and have been operated upon. All the cases, with the exception of the three cases mentioned, are living and in good bladder health. It is, however, too early to speak about "cure," for five years have not elapsed in any case, though one has already passed the fourth year in perfect health.

He attributes much of his success to a careful selection of favorable cases by means of the cystoscope, and here it may be remarked how very fully the character of that instrument has been vindicated by these results.

Not only did he only once cut into a bladder to remove a tumor which did not exist, but he had been enabled to select out of a hundred cases of vesical growth those cases which repaid operative interference. Moreover, out of some hundreds of cases of obscure urinary disease, it has enabled the author to select at least fifty cases of vesical growth the existence of which he would have been unable to pronounce with certainty without digital exploration. Much needless instrumentation and operation was thereby avoided. He states that he is much influenced, among other conditions, by the color of the tumor. If the tumor surface be translucent and of a pinkish hue, and exhibits no signs of necrosis, he knows that he is dealing at least with a growth in a favorable stage. The smoother the tumor the more one may be inclined to suspect its deeper origin, for surface epitheliomata have a great tendency to produce a true villous surface. If the tumor is white or grayish-white invariably epithelioma may be diagnosed. It is also extremely suspicious of malignancy to see a powdering of white phosphate of lime upon a tumor which has only lately declared itself.

He declared that the removal of a growth of the favorable type from the bladder is a simple and safe operation. The danger, if danger exists, lies in attacking carcinomata in their advanced stage or in ablating tumors of a benign type which have been long enough in existence to cause serious renal changes from backward pressure, or which have been suffered to enter the period of cystitis either by neglect or by maltreatment. Finally, he urges the necessity for regarding non-infiltrating tumors of the bladder in the same light which we are taught to look upon stone in the bladder. The sooner the operation is performed the better for the patient.—*British Medical Journal*, June 10, 1893.

#### EXTREMITIES.

**Nerve Injuries Complicating Fractures of the Upper Extremity, with Six Cases.** By E. DEANESLY, M.D. (Wolverhampton). Six cases have occurred at the General Hospital, Wolverhampton, during the past two and a half years, and the author thinks that nerve injuries of this kind are in reality of less rarity than might be supposed from the number of recorded cases. Many such cases are probably not detected, the symptoms being regarded as effects of disuse, or confused with the stiffness of joints and muscles which commonly occurs after fractures. Cases, too, in which nerve lesions have been produced by undue pressure of splints are, for obvious reasons, little likely to be recorded.

Of the six cases recorded, four are fractures of the humerus and two of the bones of the fore-arm. Of the four fractures of the humerus, three were complicated with paralysis of the musculo-spiral, and one with paralysis of the median and ulnar nerves, showing, as in the cases cited by Bowlby, the much greater frequency of lesions of the musculo-spiral. Of the two cases of fracture of the fore-arm, one was complicated with paralysis of the median, the other with paralysis of the posterior interosseous, a complication of which Bowlby remarks that he has been unable to find any recorded case.

As regards the mode of production of these nerve injuries, they

fall into two classes: those in which the nerve is injured simultaneously with the fracture, and those in which it becomes involved at a later period. In the first case the nerve may be injured by the same form of direct violence as causes the fracture, or by the violent displacement of portions of the fractured bone at the time of the accident. The nerve may become involved at a later period in several ways. It may be stretched or slowly compressed through imperfect reduction or subsequent displacement of the fragments; or it may become involved in and compressed by the callus about the site of fracture; or, lastly, nerves in exposed positions may be slowly compressed by splints or other apparatus used to immobilize the fractured limb.

The six cases recorded include examples of all these different modes of production. Of these, there is only one in which the symptoms can be attributed to injury of the nerve at the time of fracture through violent displacement of the fractured bone. This, however, appears to be the most probable explanation in this case, in which a compound fracture of the upper part of the shaft of the humerus was complicated with paralysis of the median and ulnar nerves. The symptoms of nerve injury appeared immediately after the accident, the hand being described by the patient as feeling "dead." The fracture was produced by direct violence applied to the outer side of the arm, and the broken ends were probably forced inward against the nerve trunks on the inner side. The fact that the belly of the biceps muscle was also completely ruptured may, on the other hand, have allowed the whole limb and the nerves with it to be violently stretched.

In two cases musculo-spiral palsy followed imperfectly reduced fracture or separation of the lower end of the humerus. The exact time, however, at which the paralysis made its appearance was unfortunately not determined. In one case it was first noted on the fifth day, and in the other not till one month after the accident. It is possible, however, in each case that it was present soon after the accident but was overlooked. The paralysis might be attributed to



pressure of callus involving the nerve. In both cases it is true there was much callus thrown out, but that involvement in callus is ever a real cause of nerve paralysis does not appear to be very well established. Unreduced displacement is probably the most important factor in all cases of so-called callus pressure.

Lastly, in two cases, in which paralysis of the posterior interosseous and median nerves respectively followed fractures of the forearm, it can, in the absence of any other probable cause, be only attributed to undue pressure from splints. There was, it is true, no direct evidence of this cause, such as is sometimes afforded by sloughs of the skin. In one case, however, the patient was afterward discovered to have complained of the tightness of the splints when they were first applied. In neither case was there any displacement or faulty union of the fragments. In one case the possibility of involvement of the nerve in callus was disproved by an exploratory operation.

The naked-eye appearance of the injured nerves was examined in three cases by an exploratory operation undertaken with a view to remove any existing cause of pressure. In none of the cases did the nerve present the slightest sign of present or past lesion; in none was there found any existing cause of pressure.

The diagnosis seldom presents any difficulty. Deanesly does not doubt, however, that cases of this kind are at times overlooked, nerve lesions not being thought of, and paralysis and contracture of muscles being confused with the general weakness and stiffness which are so often left for a considerable time after the fracture has united. This applies more particularly to lesions of the median and ulnar nerves. Paralysis of the musculo-spiral nerve produces the characteristic and familiar wrist-drop, which is little likely to be overlooked. He calls attention to two signs which should always make the surgeon suspect damage to nerve trunks in cases of fracture of the upper limb. One is, that the patient makes more than usual complaint of numbness of the fingers during the first two or three days. The other is an excessive amount of stiffness of the elbow, wrist and fingers, found when the splints are removed. Disturbance of sensation is almost always transient, but is seldom absent during the first week. Sensation is

blunted, but seldom quite abolished; sensations of numbness, tingling, etc., often persist for a considerable time. In affections of the median nerve the patient complains mostly of the tips of the index and middle fingers, less of the thumb. In affection of the musculo-spiral nerve the numbness is referred to the back of the hand and fore-arm, but in these cases complaint is less often made, and the alteration of sensation is more transient.

He makes the following further observations: Contracture both of the paralyzed and of the unopposed muscles sets in early in the case of the median nerve from the fourth to the eighth week. In musculo-spiral palsy, due to fracture of the humerus, contracture either of the paralyzed or of the unopposed muscles does not occur. Median palsy is, therefore, that which, owing to contracture, is most liable to be confused with stiffness due to prolonged immobilization. The position of the hand, however, in this case is very characteristic. When the nerve is implicated in the upper arm the patient is quite unable to supinate the hand beyond the mid position to which it is carried by the biceps and supinator longus; the wrist cannot be extended beyond the straight position; the metacarpal bone of the thumb is drawn back into the same plane as those of the fingers; and there is total inability to flex the last two joints of the index and middle fingers. The proximal phalanx can still be flexed by the action of the interossei and lumbricales. At a later time the wrist becomes considerably adducted by the unopposed action of the flexor carpi ulnaris, and the metacarpal bone of the thumb becomes approximated to that of the index finger by the similar action of the adductor pollicis. The attitude of the hand, therefore, closely resembles that which may be produced by faradizing the normal ulnar nerve in the middle of the arm. In one case, in which the median nerve was compressed in the fore-arm, the most marked feature of the hand, in addition to those just described, was the strong flexion of the little and ring fingers, due to the action of the unopposed half of the flexor profundus digitorum supplied by the ulnar nerve, and, therefore, unparalyzed. It is worthy of note that in this case contracture of this unparalyzed half of the muscle was both more severe

and more permanent than in the paralyzed muscles supplied by the median. It is this liability of contracture (organic shortening) to affect both paralyzed and unparalyzed muscles which makes the determination of the exact cause of the attitude assumed by the limb in lesions of peripheral nerve trunks so difficult to determine.

If any doubt as to the existence of nerve lesion remain after the examination of the voluntary power, sensation, and attitude of the limb, it can generally be set at rest by testing the electric excitability of the muscles and nerves to the faradic and galvanic currents. In doing this, one or two facts should be borne in mind. In the first place, when the limb has only recently been taken out of splints or plaster, the skin is usually so dry and non-conductive that the reactions cannot be accurately tested until the limb has been thoroughly washed and rubbed for several days in succession. Secondly, mere disuse of a limb from immobilization produces such a diminution of faradic excitability of all the muscles that often for several days no reaction can be obtained from a strong current. Hence diminution or loss of faradic irritability cannot be relied on as a proof of nerve lesion unless it is confined to a group of muscles supplied by a particular nerve. If loss of faradic irritability is found, some alteration, quantitative or qualitative, or both, will be found in the reaction to galvanism. In all the cases which have come under the author's notice, except one, faradic irritability had been lost; galvanic irritability, on the other hand, was retained, and in some cases increased, together with the usual qualitative alteration. In only one was there total loss of both kinds of electric excitability.

The prognosis is a point of considerable importance. It is, on the whole, extremely favorable. Only one of the six cases now recorded failed to recover. If galvanic irritability is not lost at the end of a month from the time of injury, a favorable result may always be expected under proper treatment. The time varied from three to twelve months. It was more rapid in children than in adults.

The treatment consists in passive movement, friction, and electrical stimulation of the affected muscles and nerves. As a rule, no

attempt should be made to deal with the nerve injury until the fracture is soundly united—that is, from four to eight weeks after the injury. Adhesions and contracture should then be dealt with, an anæsthetic being used, if necessary. The whole limb should then be treated with systematic rubbing and with electricity. Whether for this purpose the interrupted or constant current should be used is a subject of dispute. At present it is generally recommended to use the constant current, to which the muscles still respond. It is certain, however, that the beneficial effects of electricity do not entirely depend on its producing a muscular contraction. The efficiency of faradism, even after the muscles have ceased to respond to it, is indisputable. Duchenne, to whom we owe the use of electricity in muscular paralysis, produced his remarkable cures entirely with the faradic current. One of Deanesly's cases was also successfully treated by faradism alone. The nerve may often be faradized above the seat of lesion, and the muscles may in this way be got to respond long before volitional impulses are able to pass. If desired, the faradic current may be applied daily by a nurse or friend, and the galvanic once or twice a week by the surgeon himself.

The question of operation will naturally arise in many of these cases. No operation should be advised unless there is reason to believe that there still exists some pressure or traction on the nerve which can be relieved. Deanesly believes that the number of cases in which such a condition exists is small. Of the three cases in which an exploratory operation was done no sign of still existing pressure was discovered in any: in one the nerve lay in a groove of callus, but there was no evidence that it was compressed by it. If, however, there is any condition such as marked displacement of bony fragments, or any other cause which seems remediable by operation, no hesitation need be had in undertaking it and at least ascertaining the actual state of the nerve.—*British Medical Journal*, June 17, 1893.

JAMES P. WARBASSE (Brooklyn).

## CORRESPONDENCE.

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### THE QUESTION OF PRIORITY IN DEVISING A METHOD FOR THE PERFORMANCE OF INTRA-CRANIAL NEURECTOMY OF THE FIFTH NERVE.

IN his memoir on "Intra-cranial Neurectomy of the Fifth Nerve," published in the *ANNALS OF SURGERY* of May, 1893, Frank Hartley refers to my article on the same subject which appeared in the *Archiv. für klinische Chirurgie*. I wish to state that this method of operation was devised by me entirely independent of Dr. Hartley. He published his first work in the *New York Medical Journal*, Vol. LV, No. 12, March 19, 1892 (not March 1, as the text incorrectly states). I performed my first operation on the living subject February 23, 1892, several weeks before. It was impossible at that time for me to know anything of Hartley's operation, for no report of his case shown at the New York Surgical Society had yet reached us.

One is not apt to devise an entirely new operation on the same day on which he performs it for the first time on the living subject. It is, therefore, quite superfluous to discuss the question as to how long the surgeon has busied himself thinking over the operation. Frank Hartley especially emphasizes that he performed the operation on the cadaver a year and a half before he practiced it on the living subject; so must I state that I performed the operation on the cadaver even before William Rose, of London, made his report to the Medical Society of London, October 27, 1890, on the removal of the Gasserian ganglion in the living subject. A short account of this can be found in the *Deutsche medicinische Wochenschrift*, No. 48, November 27, 1890. This induced me to again attempt my method on the cadaver, for the operation of Rose seemed too complicated. I

relate these facts simply to show that I devised my method quite independently of Frank Hartley, and that I have the same right as he to be regarded as the inventor of this operation.

If I did not refer to Hartley's publication in my work alluded to above, it was because the *New York Medical Journal*, No. 12, March 19, 1892, had not been received when my manuscripts were completed. All of the other publications in this line known to me were fully referred to. These were William Rose (London), "Removal of the Gasserian Ganglion for Severe Neuralgia," Medical Society of London, October 28, 1890; the *Lancet*, November 1, 1890, and Victor Horsley (London), "Remarks on the Various Surgical Procedures Devised for the Relief or Cure of Trigeminal Neuralgia," *British Medical Journal*, November 25, December 5 and 12, 1891.

Inasmuch as Hartley has quoted in his last report all the cases that have come to his knowledge, five in all, it may not be without interest if I mention my cases. I have operated five times in this manner. The first of these cases was reported in the above-mentioned article. The two following cases were reported in the *Deutsche medicinische Wochenschrift*, No. 15, of April 13, 1893. The two last cases operated upon have not yet been published.

The operations performed in my five cases were all about the same, with the exception that in two cases, on account of hæmorrhage, I found it best to do the operation in two stages. Three of the operations were done in one stage. In these three cases, on account of the very severe symptoms, the entire ganglion Gasserii, and also the entire length of the central root passing from the ganglion to the pons varolii, were removed. The operation is as follows: After making the flap of scalp and bone in the temporal region, the cranium is opened, and the dura mater stripped up from the base of the skull. The root of the arteria meningea media is next ligated and divided; and then the third and the second divisions of the fifth nerve, in their entire extent, from the foramina ovale and rotundum to the ganglion Gasserii, are freed. Next the dura mater is lifted



back from the nerves with the elevator, and then the nerves are lifted away from the underlying bone. This isolation is carried as far back as the ganglion itself, indeed, until the ganglion is brought into view. The second and third divisions are now divided with a pointed tenotome at the foramina rotundum and ovale. The Gasserian ganglion is now seized transversely in its posterior part by the forceps devised by Thiersch for drawing out nerves, and by careful twisting the entire trifacial root connected with the ganglion is brought away. In my last three cases I have been able each time to remove the trigeminus root in its entire length of 22 millimeters. The first division tears loose very near the ganglion. In my work "Entfernung der Ganglion Gesseri und der central davon gelegenen Trigeminusstammes," published in the *Deutsche medicinische Wochenschrift*, 1893, No. 15, I have illustrated such a nerve trunk after its removal, and also given a cut of the field of operation.

The course of these cases after the operation has been good. In none has the neuralgic pain returned.

PROF. DR. FEDOR KRAUSE.

*Altona, Germany, June 4, 1893.*

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## INFECTIOUS APPENDICITIS.<sup>1</sup>

By ROBERT T. MORRIS, M.D.,

OF NEW YORK.

THE factors in infectious appendicitis may be grouped as follows :

(1) Histological.

A thick layer of adenoid tissue.

(2) Anatomical.

(a) A soft, distensible tube of mucosa and adenoid tissue within a confining outer tube of muscle and peritonæum.

(b) Lymphatics leading to the lymphatics of the colon and mesentery.

(c) Veins leading to the superior mesenteric vein.

(d) Subperitoneal connective tissue investment.

(e) Peritoneal investment.

(3) Pathological.

Mixed bacterial infection from the intestine.

### ABSTRACT DESCRIPTION.<sup>2</sup>

Appendicitis is an infectious exudative inflammation of the appendix vermiformis cæci, originating in any local cause for displacement of the guarding epithelium of the mucosa of the appendix, and progressing by bacterial invasion into the rich layer of adenoid tissue which is under compression.

Bacteria once having penetrated the adenoid tissue remain there and develop for an indefinite period of time and with widely varying degrees of rapidity.

<sup>1</sup> Paper read at the Pan-American Medical Congress, September, 1893.

<sup>2</sup> Photomicrographs by Dr. J. C. Smith and pathological data verified by Dr. H. T. Brooks, at the Pathological Laboratory of the New York Post-Graduate Medical School.

The natural course of the inflammation is protracted and marked by slow erosion of the mucosa and adenoid tissue, caused by the pressure of exudates and infiltrates.

A more rapid destructive process follows passive choking of the inner tube within the outer tube when exudation into the adenoid tissue is excessive.

The most rapid destructive process occurs when the muscular sheath irritated to the point of spasm contracts firmly down upon the swollen inner tube.

Incidents in the course of the disease are: (1) Infection along the lymph channels from the appendix to the colon, causing typhlitis, paratyphlitis, perityphlitis and cæcitis. (2) Extension of thrombosis along the veins of the appendix, resulting in mesenteric thrombo-phlebitis, pyle-phlebitis, portal embolism, and abscess of the liver. (3) Local peritonitis from direct infection of the peritoneal investment of the appendix. (4) General peritonitis from infectious thrombi in the veins of the portal system, and from poisoned peritoneal exudates. (5) Local abscesses in subperitoneal connective tissue.

#### DETAILED DESCRIPTION.

The thin mucosa of the appendix vermiformis cæci is composed of a single layer of columnar epithelium cells. Beneath the epithelial coat is a layer of adenoid tissue so thick that it often constitutes the principal mass of tissue of the whole appendix.

The layer of epithelium which guards the adenoid layer against infection is easily injured by foreign bodies or faecal concretions in the lumen of the appendix, especially when violent exercise or a blow causes forcible impact of mucosa against such bodies. I believe that many acute attacks of appendicitis thus follow the efforts of parturition. The epithelial layer of the appendix is also rendered less resisting when the mucosa of the colon is inflamed from any cause. Thus appendicitis is apt to occur as a complication of typhoid fever or dysentery or cholera, and it is, I think, common as one of the sequelæ of la grippe, although the New York Board of Health reports do not verify this belief. Nematodes and amœbæ coli are probably responsi-

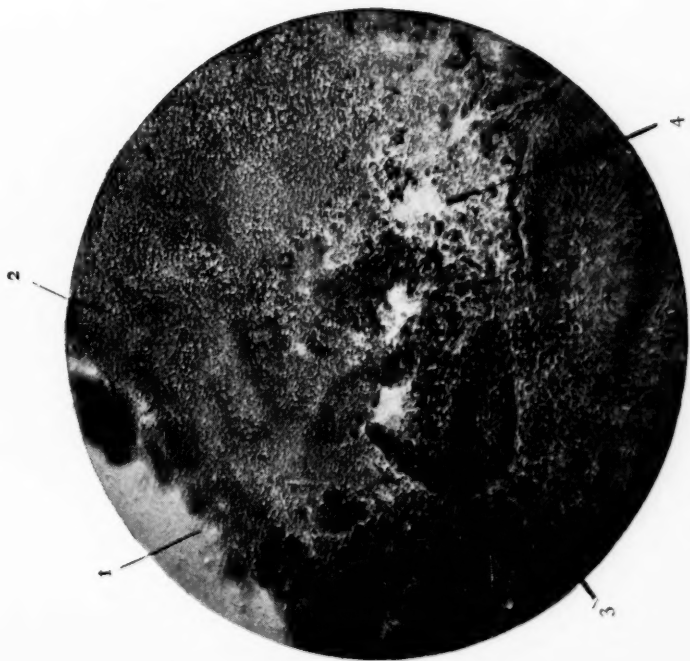


FIG. 3.—Section corresponding to Fig. 1, but from mild case of appendicitis.

1. Free border once occupied by mucosa.
2. Necrotic area.
3. Broken down mucous follicles.
4. Breaking down adenoid tissue.  $\times 600$ .

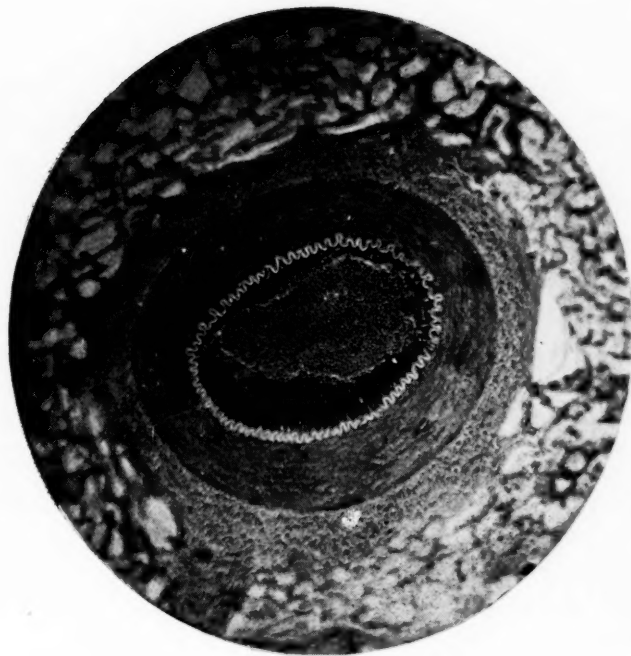
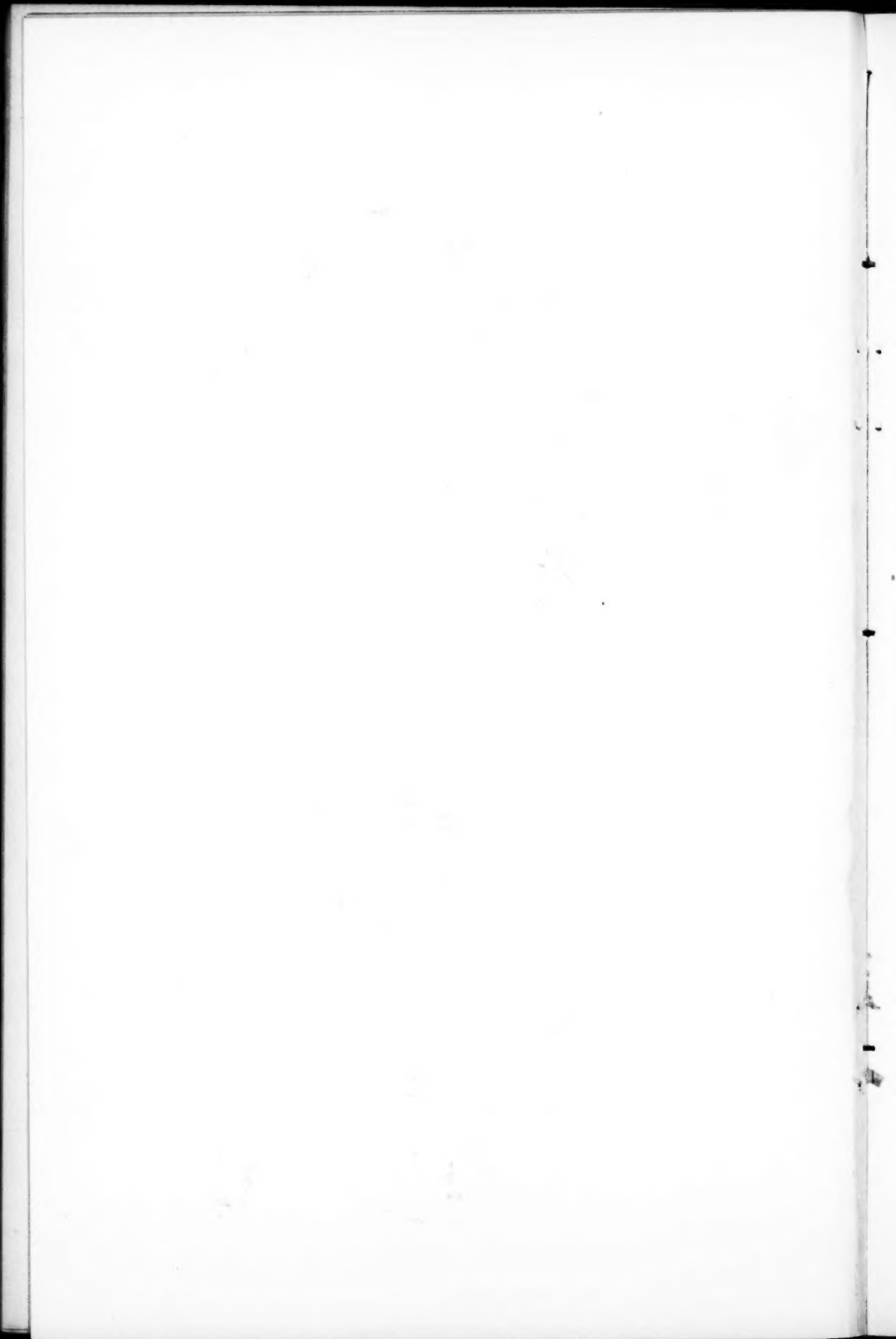


FIG. 4.—Section of solitary artery of the appendix from mild case of appendicitis, showing proliferating endarteritis.  $\times 150$ .



ble for some cases of appendicitis, and tubercle bacilli open the gates for other infection. The mucosa and adenoid tissue are easily crushed, as by the efforts of the athlete, compressing his appendix between a full cæcum and the pelvic wall.

The mucosa may disappear in natural retrograde changes of the appendix (Ribbert). When once the epithelial guard has been broken, streptococci, staphylococci and bacilli at once enter the exposed adenoid tissue very much as saprolegnia finds entrance to the tissues of a living fish at a point where the scales have been torn away. All structures of the appendix then become more or less distended with fibrin and serum, while leucocytes crowd the lymph channels.



FIG. 5.—Transverse section of a longitudinally split appendix. Exudation and lymphadenoid proliferation moderate.

1. Mucosa and adenoid tissue bulging a little.
2. Submucoas connective tissue not thicker than the combined muscular and peritoneal coats.
3. Muscular and peritoneal coats, not hypertrophic.

If the process is a mild one, the mucosa of the appendix is gradually replaced by connective tissue. Necrosis of the adenoid tissue then progresses slowly from obstruction to capillaries and lymph channels, and an erosion of the adenoid tissue eventually bares the inner muscular coat of the appendix. Connective tissue next fills the gaps, the lumen of the tube is obliterated, and the disease is at an end; years, perhaps, having elapsed since its inception.

The appendix is usually supplied by a single artery. If proliferating endarteritis occludes the lumen of the solitary artery the result can be readily foretold.

The appearance of an appendix which is the seat of mild infectious inflammation varies according to the amount of exudates in its tissues. In some far-advanced chronic cases the



appendix is hardly firmer in texture or different in appearance from a normal one, and in all probability many a death trap of this sort has been replaced in the abdomen by the surgeon who, in response to the patient's symptoms, has made an exploratory incision and then failed to find what he expected to see. One can no more trust an appendix than he can an egg by external appearance. When exudates distend the tissues greatly the appendix is firm and tense like the erect penis of a child. On making an incision through the outer tube in such a case, the inner tube

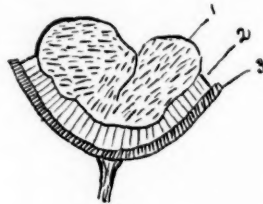


FIG. 6.—Transverse section of a longitudinally split appendix. Exudation excessive.

1. Mucosa and adenoid tissue bulging prominently.
2. Submucous connective tissue about seven times thicker than the combined muscular and peritoneal coats.
3. Combined muscular and peritoneal coats.

bulges so prominently into the opening that one can readily understand how great has been the pressure. The inner tube then being split, is usually found to be studded with minute punctate reddish dots and a few ashy necrotic specks upon its free surface, and it has a more pultaceous feel than a normal mucous surface. It is difficult for an untrained eye to discover by gross appearance whether any mucosa remains or not.

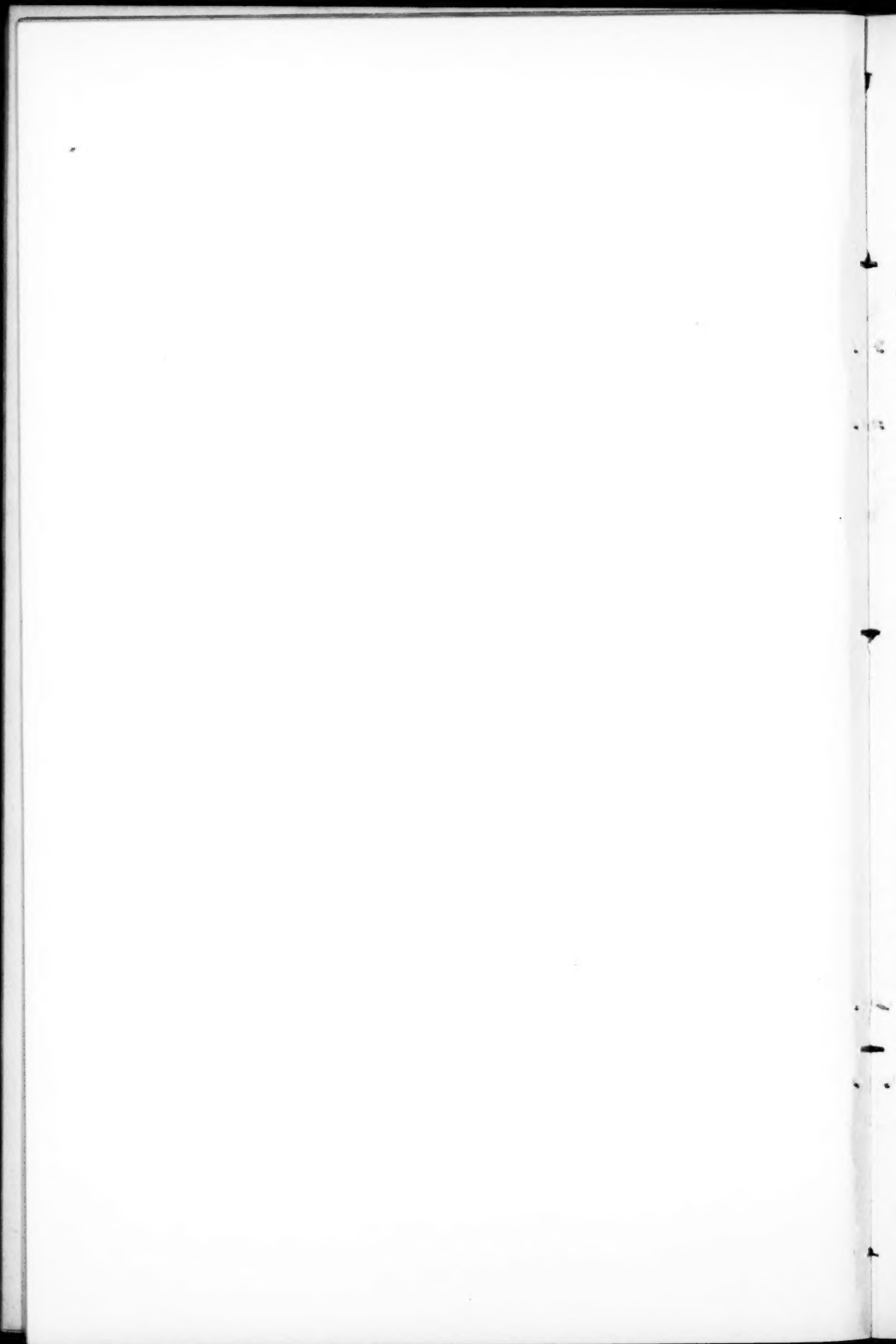
When bacteria have finally begun to poison the investing peritonæum of the appendix, exudates are thrown out from the surface of near-by peritonæum to wall in the offender, and absorption of bacterial products may be so rapid that the peritonitis remains quite local, and soon subsides, to reappear at some later period. This is an interesting phenomenon, and rather difficult of explanation unless we assume that increased production of poison is met by increased activity of absorbents of the peritonæum to a point of close compensation, and that the organ-



FIG. 7.—Longitudinal section of vein, showing thrombus surrounded by leucocytes, from mesentery of appendix in mild case of appendicitis, X 600.



FIG. 12.—Incision one inch and a half in length, ten days after removal of the appendix.



ized lymph, which remains in the form of adhesions, is not so susceptible to later poisoning as the original serosa, each mild attack of peritonitis having then a moderate tendency to protect against recurrence.

In more virulent cases a large mass of peritoneal exudate forms, and this becoming infected breaks down into pus or thin fluid, which is in turn walled in by more exudate furnished by the almost intelligent peritonæum.

In the most vicious cases the peritonæum is so poisoned at the outset that it loses control of itself and cannot build coffer-dams.

Bacteria may infect the subperitoneal connective-tissue layers and cause local "cellulitis" with resulting abscess, but this inflammatory process is by no means so common as it was supposed to be in the days when "cellular tissue" was thought to be a good descriptive term.

Thrombi form in the veins of the appendix and its mesentery in the mildest of cases, and these may go on to extensive mesenteric thrombo-phlebitis, with resulting general peritonitis, pyle-phlebitis, portal embolism and liver abscess, in cases in which the appendix has not been held in suspicion at all.

The phenomena of infectious appendicitis vary according to the predominating species of bacteria in any given case, but the pyogenic streptococci and staphylococci do most of the wide infecting.

Violent cases of appendicitis usually attract attention directly to the real source of the trouble when the exudates and infiltrates cause sloughing of small or large portions of the inner tube by cutting off blood supply to small parts, or by choking the whole inner tube within the outer tube. At first the pain is reflected to various parts of the abdomen and there is general tenderness of the whole peritonæum, but at the end of twenty-four or forty-eight hours we can, as a rule, find the most marked tenderness at the point made classical by Dr. McBurney in the right inguinal region. We must not forget, however, that the appendix may be down in a scrotal hernial sac, or attached to the liver or to the left ovary. I have no explanation for the fact that the whole peritonæum is inflamed before the pain becomes localized, except-

ing on the hypothesis that the peritonæum needs to be pretty thoroughly irritated by poison before it resents the onslaught and walls in the intruder. The cæcum, distended by gas, may hide the tender point in the right inguinal region, and may even mask a large abscess or mass of exudate.

The most acutely painful symptoms occur in those cases in which the muscular coat of the appendix is excited to spasm, for when this happens the intestine contracts in sympathetic spasm at short intervals, causing the most agonizing colic. Fig. 8 represents an appendix which I caught in the act of spasm, and it explains why perforation is more apt to occur at the tip, the exudates in the tissues being crowded to that point, so that the knobbed tip is under great pressure.

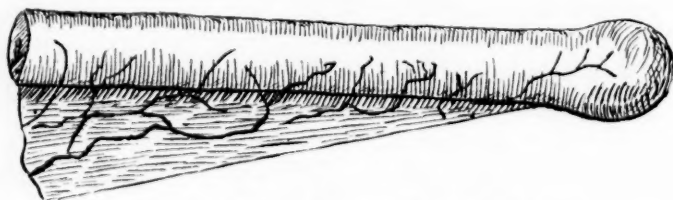


FIG. 8.—Appendix with muscular coat in state of spasm.

Fig. 9 shows the same appendix immediately after the mesentery and muscular base of the appendix with their contained sympathetic nerves had been cut. In this appendix both longitudinal and circular muscular fibres were found to be fully developed clear to the tip, so that the case probably represents an ordinary one.

It is not improbable that the appendix sometimes cuts itself in two by irregular contraction of the muscular coat, just as an annelid or nereid, when held by one extremity, cuts itself away from the enemy. It is not an uncommon experience to come upon a separated appendix or portion of appendix when we are operating, but ordinary circumscribed necrosis may be responsible for this.

Next to the waves of colic, the most distressing pain occurs in the cases in which peritoneal exudates form a solid mass over the iliac arteries, the blow from the strong pulse there being

equivalent to seventy finger-pokes per minute against an inflamed abscess wall. If added to this the large nerves of the pelvis respond to irritation with neuralgia, the condition of the patient is deplorable. Infection from the appendix to the walls of the cæcum and colon in mild cases, or in the early stage of severe cases, may cause a constipation from inhibition of peristalsis, or a diarrhœa from the irritation by ptomaines. The infection may be so insidious as to cause perforating necrosis of the colon several inches away from the appendix, and in a case in which the appendix is to outward appearance almost normal. There is apt to be an area of thrombosed veins, however, extending between the

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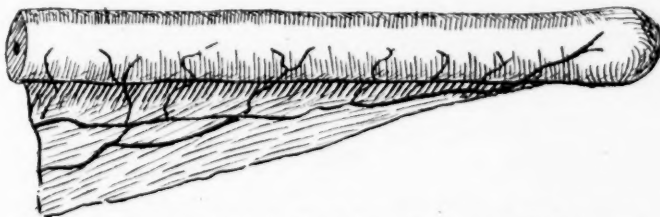


FIG. 9.—Same appendix as in Fig. 8 immediately after relief of spasm by cutting mesentery and muscle at base.

appendix and necrotic bowel. The cases of infection at a distance from the appendix have been classified as typhlitis, paratyphlitis and perityphlitis, according to the particular structure that was supposed to be involved, but as a matter of fact, all structures of the bowel wall are usually involved at one and the same time, and it is not difficult, so far as my experience goes, to trace the infection to its focus at the appendix. I have not as yet, at operation, found any variety of typhlitis that did not evidently begin at this focus. Sometimes infection of the bowel wall takes place by a short route at points where the tip of the appendix touches, but the bowel ordinarily becomes infected by progression of infection along the lymph channels in the loose submucous or subperitoneal connective tissue planes.

Bilious vomiting, while not always present, is a characteristic symptom in all forms of acute appendicitis, and is probably due to a reversing of peristalsis at the duodenum by ptomaines absorbed by the peritonæum and excreted with the bile.



Relapsing cases of appendicitis, more properly called exacerbating cases, are, I believe, of four principal types:

(1) Cases in which the poisoned peritonæum of the appendix responds in various mild exacerbations of local peritonitis. Colic is not a marked feature of these cases, and the septic symptoms are unimportant.

(2) Cases in which the muscular coat of the appendix is excited to the point of spasm from time to time. Colic is the most salient symptom, but septicæmia is neither severe nor persistent, excepting as a result of further complications.

(3) Cases in which small or large portions of the inner tube slough and cause well-marked septicæmia until the sloughs have decomposed enough to escape into the bowel.

(4) Cases in which a chronic abscess cavity fills in exacerbation and empties by slow absorption at irregular intervals. Persistent septicæmia is the chief symptom.

I do not make a classification of perforating cases, because any appendix may perforate at any hour when exudates and infiltrates have caused a sufficient degree of necrosis. Hydrops of the appendix and other odd results of appendicitis are self-explanatory. Exacerbating cases of appendicitis eventually come to an end by slow destruction of the mucosa and adenoid tissue, or by acute inflammatory disaster, or by surgical operation.

I am in favor of early operative treatment in practically all cases of appendicitis, in view of the fact that the inflammation is so infectious in character. So long as the patient chooses to carry about with him a hive of bacteria, he knows not just when or where they will swarm. Moreover, every hour of progress of an acute exacerbation of appendicitis means increased damage to viscera, and the conscientious physician cannot allow that for a patient who trusts him. Many cases of appendicitis run such a mild course for years that the patient is hardly aware of his trouble, and yet the mildest case may end in a disastrous exacerbation at any hour. The simple diagnosis of appendicitis I hold to be sufficient excuse for operation, and as soon as this stand is taken by physicians generally, the patients who would die from the disease under procrastinating treatment will be spared to their

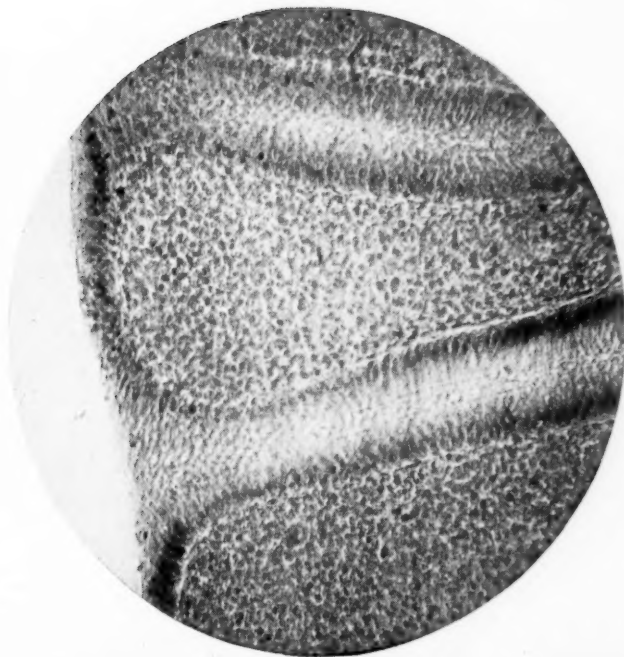


FIG. 1.—Section of normal mucosa and adenoid layer of appendix, showing follicles.  $\times 600$ .

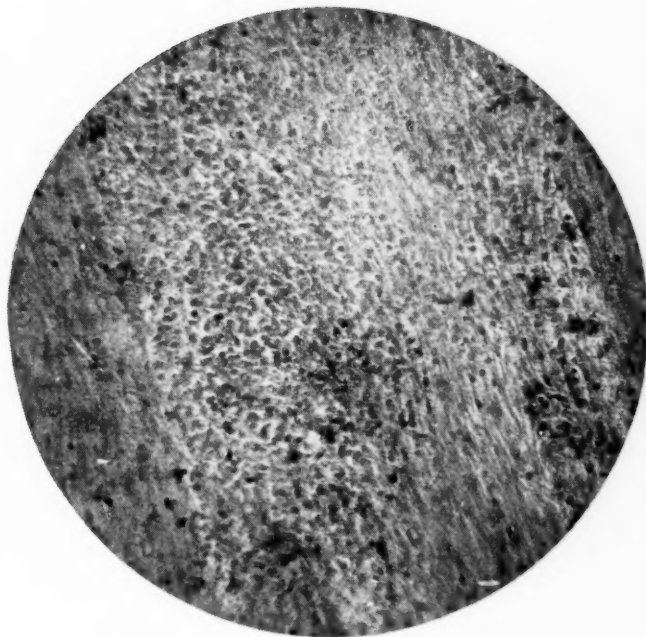
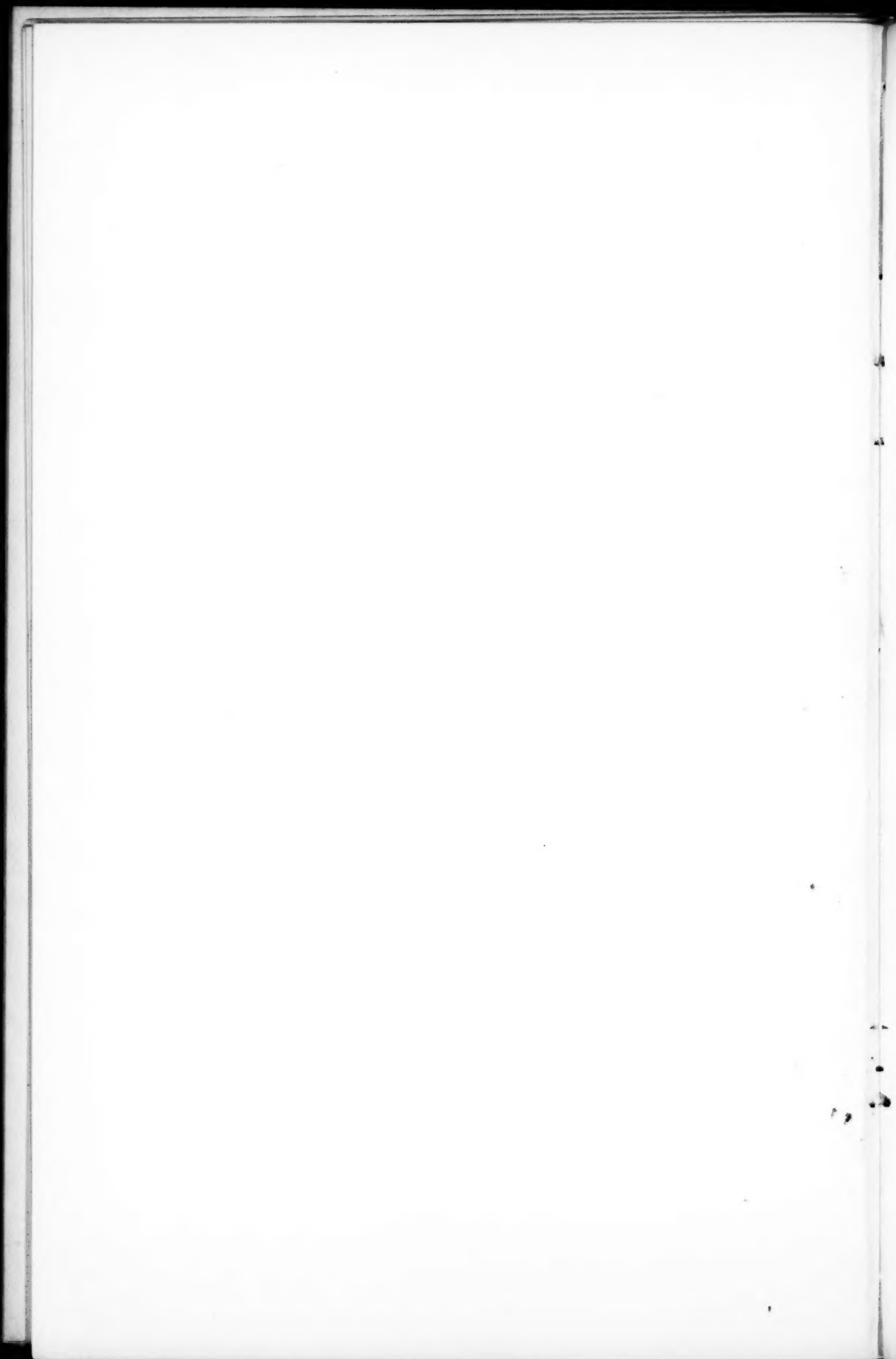


FIG. 2.—Section of muscular coat from mild case of appendicitis, showing infiltration of leucocytes in lymph spaces.  $\times 600$ .



families and friends, to say nothing of saving time and relieving anxiety for patients who have exacerbations. I do not know how any other deduction can be rational.

I have adopted three distinct lines of operative procedure for the requirements of different sorts of cases, and employ three standard incisions.

My first is for cases not complicated by extensive adhesions or pus.

The incision is one inch and a half in length through the right linea semilunaris and all structures of the abdominal wall. It is sufficiently oblique to follow the natural trend of the external oblique aponeurosis. This very strong aponeurosis is, perhaps, the structure most worthy of attention in this vicinity. It must not be pulled away from its slight vascular connections with retractors, or sloughing will occur, and it must be closely sutured to prevent hernia. The incision having been made, the next step in the technique consists in finding a longitudinal muscular ribbon which labels the colon. This ribbon on being found is pulled through the incision until the appendix comes up on the end of it, like an eel at the end of a line, the rest of the colon being instantly replaced in the abdomen as fast as it emerges. The mesentery of the appendix is ligated with small catgut, and the outer tube is snipped through with scissors very close to the cæcum. The inner tube is then ligated with a strand of eye silk well down into the cæcum, and the stump of the inner tube cut short.

The peritonæum round about the stump is scarified until pink serum exudes, and then closed over the stump with three or four Lembert sutures of catgut. If the tiny ligature escapes for any reason it will go into the lumen of the bowel. The plan of simply ligating the stump of the appendix is undesirable for several reasons. In the first place the ligature includes infected tissue, and perforation is quite likely to occur below the point of ligation. When the stump separates it may leave a troublesome mucous fistula if the abdominal wound is treated as an open one, or ordinary signs of perforation occur if the abdominal wound has been closed. If the stump of the appendix heals nicely

under ligature, it leaves a scar which is the weakest point in the intestinal tract; an "Esquimaux window" scar. For these reasons I believe that the ligature will give place to the suture, or, better yet, to the combined suture and ligature as described.

The small wound of the abdominal wall is closed with silkworm-gut sutures which include peritonæum, transversalis fascia, and transversalis and internal oblique aponeurosis, knots being cut short to remain permanently. The external oblique aponeurosis must have its own tier of silkworm-gut sutures. The skin incision is very prettily closed with fine catgut.

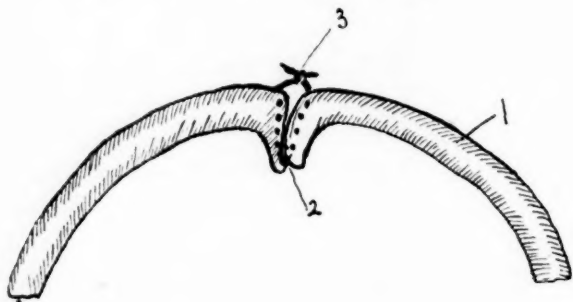


FIG. 10.—Diagrammatic view of stump treated by combined ligature and suture.

1. Transverse section of portion of cæcum.
2. Tiny ligated stump of inner tube of appendix.
3. Lembert suture burying stump. Dotted lines show course of suture beneath peritoneal coat.

My second incision is for cases with extensive adhesions, but without pus or infected exudates. It is twice the length of the first incision, and the three-inch cut extends through the right linea semilunaris as in the first one and in the same direction. The patient is placed in Trendelenburg's position for this operation, so that we can work easily by sight with minimum amount of disturbance of viscera. The wound of the abdominal wall is closed with four tiers of sutures. The first, of silkworm-gut for peritonæum, transversalis fascia, and transversalis aponeurosis; the second, for internal oblique aponeurosis; the third, for external oblique aponeurosis, and the fourth, of catgut for the skin. Each layer of aponeurosis must have a separate tier of

sutures, for the reason that its muscle pulls in a separate direction from the others. The silkworm-gut knots are cut short and left permanently.

My third incision, three times the length of the first one, is for cases with abscess or infected exudates, and is made over the point of greatest dulness in the inflamed area, no matter where that may be. The danger of infecting peritonæum is thus lessened, and easy access is gained to the point where most work is to be done. The patient is placed in Trendelenburg's position, and we work by separating adhesions in a direction cephalad from the groin. By this plan of procedure each separate collection of pus escapes outward upon the abdominal wall,

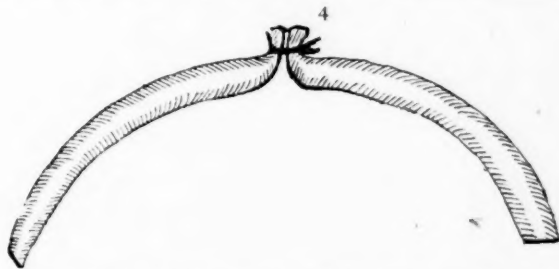


FIG. 11.—Simple but risky method of ligating stump of appendix. Same section as in Fig. 10, but showing ligation of all tissues of unburied stump.

4. Ligation.

while adhesions yet remain cephalad and dorsad to protect the abdominal cavity. As a matter of fact, I have learned by experience to have little fear of pus in the abdominal cavity when it can be reached with saline solution and the drainage wick.

As soon as an abscess cavity is opened it is cleansed with a fifteen volume solution of peroxide of hydrogen, and the septic cavity thus rendered harmless before adhesions are further separated. This is one of the most valuable points in the management of pus cases. The diseased appendix is finally removed and all adhesions loosened. If we rest content with evacuating abscesses simply, the diseased appendix remaining may cause septicæmia or further appendicitis, and adhesions remaining will bind the bowels in faulty position, so that the patient may remain an invalid perhaps for life. We shall have fewer and fewer of these



cases as the advantages of early operation are gradually comprehended, and as the necessity for thorough work in desperate cases is appreciated.

If any pus or infectious material escapes into the abdominal cavity, we must wash it out with warm normal saline solution. This will not injure the serosa, whereas common water or solutions of chemical disinfectants are quite sure to injure the serosa and cause vexatious adhesions at least. Common water introduced into the peritoneal cavity has killed many a patient a month or a year later. The peritoneal cavity is the one place in which antiseptics are unnecessary or positively harmful in surgery, but elsewhere throughout the operation an antiseptic technique cannot be too rigid.

In the cases with pus or infected exudates the bowel is usually found to be infected and almost, if not quite, gangrenous in places. Such damaged bowel is sutured with seven-day catgut to the margin of the abdominal wound, so that when sloughing occurs later, or when intestinal contents are to escape, they will appear externally instead of intra-abdominally. The next step is the most important of all in badly-infected cases, and it consists in the introduction of a wick of absorbent gauze as large as one's thumb, surrounded by gutta percha tissue or protective silk, through which small holes have been snipped. The wick is placed with one end down in the pelvic cavity and the other end exposed externally, so that a large absorbent dressing placed over it will suck the peritoneal cavity dry, and keep it sucked dry. The absorbing dressing will sometimes require hourly renewal. An immense amount of offensive peritoneal fluid is discharged through this wick for about forty hours, and as soon as the discharges rapidly decrease the wick is removed. For further drainage we then depend upon osmosis produced by the introduction of deliquescent salts into the bowel. When the wick is removed adhesions will have made a well into which we can pour peroxide of hydrogen until suppuration diminishes, and then the process of granulation can be hurried by the use of balsam Peru.

My statistics in appendicitis cases to date, roughly classified, are as follows :

	Recoveries.	Deaths.
Cases without extensive adhesions, infected exudate masses or pus . . . . .	28	0
Cases of extensive adhesions without infected exudate masses or pus . . . . .	9	0
Cases with infected exudate masses or pus . . . . .	7	4

Two of the deaths were among my first cases, at a time when there was good authority for simply opening their large abscesses and not separating adhesions or removing appendix remains. The abscess cavities were treated antiseptically, but both patients died of septicæmia; one a week after operation, the other about a month after operation. I now know that both patients probably had multiple abscesses. Two of the patients who recovered were treated in the same crude way. One had another attack of appendicitis a year later, and the other is an adhesion invalid in consequence of this bad surgery. In all of the other cases all adhesions were separated and the appendices removed. By far the largest number of the cases were treated within the past twelve months, and among these two deaths have occurred; one from shock in a case with pus and old firm adhesions binding damaged viscera together in a snarl. Resection of intestine should have been done immediately in this case, instead of tedious separation of adhesions. The other death occurred from acute obstruction of the small intestine a week after operation, when I happened to be out of reach. Judging from late experience I feel that all of the forty-eight cases could have recovered under the technique which would now be employed.

Because of the great amount of interest recently shown by surgeons in appendicitis cases, there is a tendency on the part of some to cry "fad," and to quote the extravagance of ovarian surgery. There is, however, a marked difference between following a fad and suddenly awakening to the full appreciation of the fact that through all of the centuries we have been burying unnecessarily a certain class of patients. An inflamed ovary may be a very useful organ. It may yield to treatment, and it seldom threatens life excepting when it is the seat of important

neoma or abscess. An appendix vermiformis, on the other hand is always useless and when infected is a direct and constant menace to life. Its bacteria cannot disappear under medical treatment, though exacerbating symptoms may subside.

Appendicitis has recently been termed the "American disease." I doubt if it is more common here than in other countries, but fear that it may have been overlooked. This assumption is based upon the fact that physicians of my acquaintance who had not made the diagnosis of appendicitis until recently, now find several cases of it in their practice during the year, and are able to call to memory cases which died under a different diagnosis in former years.

The following list of diagnoses had been made in cases in which at operation or at necropsy I found typical appendicitis lesions: Typhoid fever, la grippe, typhlitis, perityphlitis, paratyphlitis, cæcitis, intussusception, idiopathic peritonitis, salpingitis, ovaritis, gall stones, gravel, bilious colic, bilious fever, bilious peritonitis, malarial fever, psoas abscess, abscess of abdominal wall.

The specimens of appendices which I now present for inspection are not very dissimilar in outward appearance. The first specimen is normal, the second is one in which the mucosa is disappearing. In the third mucosa has gone and adenoid tissue is disappearing. In the fourth neither mucosa nor adenoid tissue remain and connective tissue has taken their place.

Microscopic sections from these specimens, stained to show bacteria and pathological changes wrought by them, are here exhibited.

I have not, as yet, been able to secure a specimen showing simple catarrhal inflammation of the appendix, and believe that the term as ordinarily applied is a misnomer.

## A CONTRIBUTION TO THE SURGERY OF THE GALL BLADDER.<sup>1</sup>

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THE following communication is based largely upon personal experience and is intended briefly to discuss, from the standpoint of the anatomist and surgeon, those affections which concern the gall bladder and extra-hepatic biliary passages.

While this field is one of the most brilliant and promising, anatomical and pathological considerations give it distinct limitations. It is seldom possible to cure, or even to relieve, malignant diseases involving the gall bladder or the gall ducts. With a few brilliant exceptions operations are of questionable value in most cases of chronic obstruction to the bile flow from causes other than stone. Unless the obstruction is situated below the point where the cystic empties into the common duct, so that the flow may be deviated by way of the gall bladder into the duodenum, surgery offers little or no relief to a permanent cholæmia. On the other hand, the varied manifestations of biliary calculi—the discomforts and disabilities of a mild cholelithiasis, the prolonged sufferings caused by large and impacted stones, the recurring agonies of biliary colics and the frequent perforations from pressure-ulcerations—all these conditions may be safely and permanently cured by the devices of modern aseptic surgery.

From the brief pressure upon the biliary passages caused by the obstruction of an acute catarrh, material changes in the gall bladder and its ducts seldom if ever occur. In chronic

<sup>1</sup> Read before the American Surgical Association, May, 1893.

obstructions, whether caused by the impaction of calculi or by cicatricial stenosis, marked changes take place which have a very important bearing upon the question of surgical methods. In most instances there is an extensive dilatation of the gall bladder and ducts by which surgical manipulations are materially aided, whether the gall bladder be opened, extirpated, or made to communicate with the duodenum or colon. In other cases the gall bladder is contracted, thickened and friable—a condition generally, though not always, caused by accumulations of stones, and one which makes operations upon this organ at times extremely difficult. The common and hepatic ducts in a state of chronic dilatation are much more easily recognized and operated upon than when in their normal condition.

Catarrhal processes in the cystic duct may obliterate that passage and result in a chronic enlargement of the gall bladder from the accumulated discharges of its mucous membrane. Dilatation from this cause alone, without a history of previous gall stone attacks and uncomplicated by an impacted stone, or by a new growth, is very unusual and has never come under my observation.

From the pressure of tumors on the common duct, or upon the cystic and hepatic ducts, we may have remote changes similar to those caused by simple stenosis. Such effects may be recognized during life, though it may be difficult or impossible to make out their exact cause.

Cancer in the gall bladder and in the biliary passages is generally secondary to that disease elsewhere. At times, however, this disease is confined to the gall bladder itself and admits of total extirpation with some chance of permanent cure. Palliative operations are not justifiable unless the new growth is complicated with troublesome stones. At times the cancerous wall of the gall bladder is contracted upon a collection of calculi; a condition I have found once. In such cases it is hard to tell whether the pain is caused by the gall stones or by the new growth, and, therefore, the value of surgical interference is doubtful.

Very rarely we may find benign tumors pressing upon the biliary passages, or growing from their mucous surface in such a

way as to cause symptoms. These uncommon conditions should be borne in mind, though it is, of course, impossible to demonstrate or even to suspect them before exploration. Many of them from their nature and their situation admit of complete relief by operation.

Gall stones when confined to the gall bladder as a rule cause no pathological changes, and hence no symptoms. They usually remain harmless in the gall bladder unless small enough to get caught in the cystic duct.

Changes in the gall bladder brought about by the local action of stones may be limited to a simple distention of that organ from an impaction of the cystic duct. More frequently the prolonged efforts of the gall bladder to rid itself of these bodies result in an hypertrophy of its walls, which I have often found firmly contracted upon a mass of stones. The peritoneal covering, irritated in the course of this process, becomes inflamed and adherent to the surrounding structures. Frequently, therefore, we find a thickened and contracted gall bladder buried in firm adhesions that extend to the colon, the duodenum and even to the pylorus. These attachments may be so firm and extensive that the gall bladder is found and exposed with the greatest difficulty. The process of contraction may go on until, having expelled all the stones, or all but one or two, the gall bladder projects from the under surface of the great lobe as a small, hard knob. The mucous surface of the gall bladder at this time is not free from chronic catarrhal processes that may end in ulceration, or even perforation.

In two such cases stones and bile escaped from the gall bladder while I was separating its adhesions.

When thickened and contracted the walls of the gall bladder in a living subject are friable. Digital dilatation is almost invariably accompanied by longitudinal tearing. I have known this to occur in spite of every precaution until the whole side of the gall bladder has been torn far into the dilated cystic duct. In the condition of contraction and thickening there is also dilatation of the arteries supplying the gall bladder; hence we find considerable hæmorrhage after cutting through its walls. In



one case the hæmorrhage from this source, moderate at the operation, recurred with fatal violence on the ninth day. This is the only case in my experience in which secondary hæmorrhage was observed, even where the jaundice has been pronounced.

Obliteration of the cystic duct from chronic catarrh or from other causes may result in a distention by which the gall bladder may at times attain enormous proportions, so that the tumor may fill the whole right half of the abdomen and extend even into the pelvis. This condition is usually the result of a complete occlusion of the cystic duct by cicatricial obliteration or stone impaction. The contents of the tumor may be purulent (empyema of the gall bladder), or colorless from absorption of the biliary pigments. A cyst with this origin, therefore, must not be confounded with similar tumors of the kidney, pancreas, mesentery, or even the ovary. The distended bladder may become inflamed and adherent to the surrounding parts, which, sharing in the inflammatory process, permits spontaneous evacuation into the intestine, or even through the skin.

But it does not follow that these conditions of the gall bladder, to which I have alluded, cause any unpleasant or dangerous symptoms. A gall bladder may be very much enlarged, its functions may be entirely destroyed, and it may contain a large number of stones without causing any symptoms whatever. While it is justifiable to relieve this condition of simple dilatation, to avoid possible future complications, interference is not essential in the absence of pain and of local and constitutional disturbances. But, on the other hand, if stones get caught in the cystic duct, the patient must undergo at least the great suffering of a biliary colic, with possible impaction; and it is, therefore, a fair question for discussion whether to remove from the gall bladder all calculi as soon as they make their presence known, or to leave them to a process of nature by which they may become fixed in places hard to expose and in positions where they may excite the most serious local troubles.

Impactions in the common duct may result in a universal jaundice, which may become pronounced and fatal. The gall bladder and biliary passages become distended. Chronic inflam-

mation of the duct itself and of the surrounding parts is generally present. Perforations frequently occur with escape of bile into the peritoneal cavity and death; or a spontaneous cure follows rupture into the intestine, the stone still remaining fixed in the canal. At other times the stone makes its way by ulceration into the intestine, and permanent recovery results.<sup>1</sup> The impacted calculus, often very large, is usually rough and in its outer layers brittle, quite unlike the unimpacted stone, wherever found, with its rounded angles and polished facets.

The occasional presence of a stone in the hepatic duct I have observed clinically. It has always been associated with stones both in the cystic and common ducts, and probably has had the same origin.

The effect of an impaction in the common duct is a great dilatation of the hepatic duct. This must be borne in mind in removing stones from the gall bladder and cystic duct by digital dilatation and instrumental exploration. In two such cases (one of Cabot's and one of my own) the stone was pushed ahead far into the great fissure of the liver, where it lay hopelessly lost.

It is interesting to conjecture how cicatricial stenoses of the common or cystic ducts originate. In certain instances no stone or other cause is found, and yet a very serious obstruction to bile-flow exists. In one such case (Elliot's) the constriction consisted of a cartilaginous ring at the duodenal orifice sufficient to cause a persistent and fatal jaundice. In this instance the cause of the constriction probably lay in an old duodenal ulceration. Strictures in the common duct, as well as in the cystic, generally take their origin in an old gall-stone impaction, though they may be due to diphtheritic or catarrhal ulceration.

From the pathological standpoint, therefore, we may say that the dangers and discomforts which result, even remotely, from the presence and passage of gall stones would be safely obviated by their early removal while still in the gall bladder; for we should avoid not only the terrible pain of an occasional colic and the possible local changes in the gall bladder, but also the remote dangers of stricture and perforation.

<sup>1</sup> Intestinal Obstruction, Homans, Mixter and Wyman.

In addition to the common local changes alluded to above, we must be prepared to find occasionally one of those conditions which are so rare that we eliminate them from practical consideration.

Operations on the gall bladder and the biliary passages should not be undertaken until every means at our command to make a diagnosis has been exhausted. While it is impossible in many cases positively to exclude malignant disease, we should make every effort to avoid unnecessary explorations, for the simplest procedures in cases of advanced organic disease, whether malignant or not, are, in my experience, hazardous to life.

In some cases the presence of malignant disease, or of fatal organic disease not malignant, can be shown clearly enough to justify a let-alone policy; but at times it is impossible to understand so clearly the existing conditions that it is justifiable to abandon attempts at relief.

The diagnosis of gall stones in the gall bladder is generally easy. Attacks of biliary colic, with or without a brief jaundice, followed by periods of complete remission, point with precision to the presence of calculi in the stools. Persistent pain, with occasional exacerbations, accompanied by jaundice, indicate with sufficient clearness a stone passing slowly from the cystic duct to the duodenum. The discovery of a gall stone in the feces establishes positively the diagnosis. Persistent jaundice, with more or less persistent pain, following a history of brief attacks of less severity, indicates with considerable precision a stone in the common duct. The frequent association of malignant disease with gall stones, however, should be borne in mind, and we must, therefore, be prepared at times to find calculi associated with cancer in the immediate vicinity of the gall bladder. The youth of the patient helps us in excluding malignant disease in cases of this kind.

Between a stone impacted in the common duct and malignant disease, with prolonged and marked cholæmia, the diagnosis is often impossible. Even in the absence of an irregular or other tumor in this region it is impossible to say that the case is one of gall stones alone. Exploration frequently shows that the jaundice is due to the pressure of a malignant growth upon the common

duct, especially if the disease is situated in the head of the pancreas. Malignant disease situated here most closely simulates an impacted stone; for we have not only the same persistent pain, but a jaundice dependent very often upon a growth so small that it could not have produced any serious effect upon the general health. There is absence, therefore, of that cancerous cachexia so significant in extensive cancerous infiltration, whether of the liver alone or of all the parts about this region. Obstructions of non-malignant origin, not associated with concretions, cannot be diagnosticated with certainty, though the absence of pain favors some simple obstructive condition.

When the objective symptoms are jaundice and emaciation, we may have a complete obstruction of benign origin, a hopeless, intra-hepatic disease, or the pressure of an extra-hepatic, malignant tumor. In determining the cause under such conditions the completeness of the obstruction should be taken into account. In intra-hepatic disease causing jaundice there is always a certain amount of biliary secretion, though it may be very slight. Examination of the *faeces* will show the presence of minute quantities of bile. On the other hand, a mechanical obstruction to cause profound jaundice must be complete and must be extra-hepatic; the bile flow is totally shut off, and careful chemical tests of the *faeces* fail to show biliary pigments. Moreover, in mechanical obstructions there may be a temporary letting up of the stricture, with the sudden appearance of bile in considerable quantities in the duodenum. In progressive intra-hepatic disease, the diminution of bile is also progressive, but it is never completely absent. In practice, however, one is seldom unable to exclude organic disease of the liver.

It is not always easy to exclude tumors of the kidney and the pancreas, or even of the stomach, where a dilated gall bladder unaccompanied by jaundice is suspected. Here the most important diagnostic points are the shape and location of the tumor, and the directions in which it can be moved; confirmatory or convincing evidence may be gained from examinations of the urine and the gastric juice—or, in the case of cysts, from an examination of the aspirated fluid. The gall bladder may be so

tense as to seem solid, and in this respect not to be distinguished except by aspiration from a pancreatic, renal, or hydatid cyst, or an ovarian tumor with long pedicle. At times a tumor of the omentum, or of the transverse colon, suggests a possible gall-bladder origin. With solid tumors, however, the same importance for differential diagnosis does not exist, because, being generally malignant, hard and irregular, their nature admits of little doubt, and the uselessness of exploration is generally clear. Yet we may have solid tumors of the kidney, or localized benign growths in the liver, undistinguishable, except by exploration, from tumor of the gall bladder.

In gall-stone cases, except in rare instances, the gall bladder cannot be felt, and, moreover, local physical signs are often entirely wanting; hence, it is necessary sometimes to consider the possibility of a cirrhosis of the liver, associated with jaundice.

The diagnostic features of this disease are usually sufficient to make its presence or its absence certain. I have never found this condition in any of my cases. As already stated, we must be prepared to find at times one of those unusual conditions which from their rarity we exclude in the process of eliminative diagnosis; such, for instance, as localized abscesses associated with jaundice, hydatids, foreign bodies which have migrated from the alimentary tract, and so forth.

In the majority of cases, however, the conditions demanding investigation are sufficiently clear to direct with certainty the surgeon's course, one class comprising the hopeless and inoperable, another comprising almost invariable success, immediate and remote, and a third, between the two, justifying exploration, but offering only moderate hope of relief.

The indications for exploration should be clear. Prolonged pain in the region of the gall bladder, without jaundice, is a sufficient cause for investigation in the absence of a certain diagnosis of hopeless organic disease. Cholaemia without pain, in the absence of positive evidence of organic disease, demands interference. Pain that is intermittent and infrequent, explained by the discovery of gall stones in the faeces, justifies, but does

not demand, an operation on the gall bladder, unless it is evident that there is a large number of stones, and unless there is serious disability. In other words, nature may be trusted to take care of small stones if we can afford to pay the price she exacts—occasional and transitory attacks of violent pain. But even if the stones are small, and if the attacks of biliary colic are short and severe, there is a limit to the endurance of the patient, which he himself must fix. The danger from the occasional passage of a small stone through the cystic and common ducts is slight; moreover, we have, in most instances, the case under constant control, because we can apply the surgical remedy the instant impactions become serious—when persistent jaundice and continuous pain menace the patient's health, or even his life. On the other hand, as I have already stated, there is a serious objection to the policy of non-interference under these circumstances—an objection which becomes conspicuous when we contrast the case of exploratory gall-bladder incisions with the difficulties of opening and closing the common duct. Moreover, it is not possible to judge of the average size of gall stones remaining in the gall bladder by the specimens found in the faecal discharges. I have found in many instances, in the same gall bladder, calculi no larger than a pin's head, and others as large as an English walnut. Furthermore, chronic obstructions, especially of calculous origin, may aid in the development of cancer.

A nodular mass in the liver, with cachexia, is a sufficient contra-indication to this operation. A marked diminution in the size of the liver, associated with ascites, is also sufficient; yet, in spite of the history and local signs, it is often impossible to say that the condition is hopeless. The differential diagnosis cannot be made with sufficient accuracy. In my own experience, malignant disease has been found instead of gall stones quite frequently, and the presence of gall stones has explained symptoms thought to be of malignant origin by our very best diagnosticians. The exploration should be undertaken, therefore, in cases of doubt where the bodily health is seriously compromised either by jaundice, or by pain, or by both. It



should not be undertaken in the cases where the disability and pain are slight and transitory, unless the attacks become very numerous; nor in the presence of malignant disease; nor in pathological lesions that are evidently hopeless. If it can be demonstrated that the gall bladder is full of stones, and if they cause repeated colics, or other persistent local symptoms, they should be removed: first, because the operation is very simple, and its dangers slight; and, secondly, because the stones may get forced into the cystic and common ducts, there to cause much greater pain and danger than in the gall bladder.

The region of the gall bladder till very recently has been described only by the pathologist and the anatomist. The time has come when an intimate practical knowledge of the relations of the gall bladder, common, hepatic, and cystic ducts, with the portal vein, vena cava, and hepatic artery, is as essential as a familiarity with the classical regions of the neck, or of the groin. To some of us the new field is even more important. In the past two or three years I have explored this locality much more frequently than I have the neck or the groin; and yet the standard works in applied anatomy have had very little to say about this most interesting region.

Just to the right of the rectus muscle, opposite the tip of the cartilage of the tenth rib, the abdominal wall consists chiefly of skin and fasciæ. In most subjects the transversalis fibres pass behind the linea semilunaris at this point. Explorations may be made here with great ease, an opening into the peritonæum large enough to admit the finger requiring an incision through the skin of not more than an inch and a half. Digital examinations may be made of the gall bladder and vicinity with great facility; and if subsequent procedures seem best the incision may be extended upwards along the border of the rectus, and outwards and downwards parallel to the border of the ribs.

The following brief description of this region is based upon twenty or more dissections made at the Harvard Medical School in April of this year:

The right upper quadrant of the abdomen, containing the liver, gall bladder, and portions of the kidney, stomach and

duodenum, is separated from the peritoneal cavity below by the transverse and ascending colon, with their mesentery. The colon is usually in contact with the abdominal wall from the ileo-cæcal valve to the splenic flexure. Extravasations will be immediately opposed by this intestinal and mesenteric barrier, which may, however, be avoided by traveling downward along the right border of the ascending colon. In extensive extravasations the fluid will easily overcome any such obstacle, but in the slow escape of bile the opposing surface will be sufficient to prevent, by rapid adhesion-formation, any considerable infection.

Above and toward the median line the stomach and duodenum act as more or less efficient barriers. Posteriorly the fluid may enter the lesser cavity of the omentum through the foramen of Winslow.

The gall bladder is situated under the great lobe of the liver, to which it is usually attached by areolar tissue, though it may be separated by a considerable interval, and have a distinct mesentery.

Variations in the shape and size of the gall bladder have been observed, and occasionally it is wanting. There have been few if any observed variations in the position. Keen has reported one case in which he found the gall bladder behind the pancreas. In the state of ordinary distension the gall bladder is in contact with the abdominal wall at a point opposite the tip of the cartilage of the tenth rib. Unless unusually distended or tense it cannot be felt in this position.

The relations of the gall bladder in the right upper quadrant are usually shown on the post-mortem table by the staining of bile. This gives in the very best way its relations with surrounding organs. In a state of distension the gall bladder is in contact with the abdominal wall, with the liver, the hepatic flexure of the colon or a portion of the transverse colon, with the duodenum, and often with the pylorus. It is therefore possible to make a communication between the gall bladder and the colon or the duodenum. The facility with which this communication may be made, however, must depend somewhat upon the size and mobility of the gall bladder itself, as well as upon similar conditions in the duodenum and colon.

The gall bladder is entirely covered by peritonæum except at its posterior surface. In some cases a fold extends from its lower portion, across the foramen of Winslow, to become expanded upon the duodenum. In about half the dissections I have found this fold constant; in other cases there is a reflection from the under surface of the great lobe of the liver itself to the duodenum; in others this fold is absent. In such cases the peritonæum extends to the kidney, covering the anterior surface of that organ; thence it is reflected over the inferior cava to the vertical portion of the duodenum. These folds are of great importance in operations upon the common duct and upon the duodenum. A vertical incision, carefully made so as to avoid the subjacent vessels, followed by digital separation, permits the exposure of the head of the pancreas and the under surface of the duodenum, with the whole length of the common duct and its outlet through the duodenal mucous membrane. These folds are exposed, with the foramen of Winslow, duodenum and kidney, by drawing the stomach, transverse colon and duodenum down and toward the left. If the body is placed in the erect position the intestines fall and leave the space free. For this purpose the Trendelenburg table, reversed, is of great assistance. The peritoneal folds thus briefly described are of great importance in operations upon the cystic, hepatic and common ducts, and upon the head of the pancreas and the posterior wall of the duodenum.

The gall bladder itself, attached by areolar tissue to the under surface of the liver, has walls that are more or less variable in thickness within the limits of health. In cases of prolonged contraction the gall bladder is thickened by an hypertrophy of its muscular coat; in cases of simple distention, unaccompanied by chronic contractions, they may be extremely thin, and even translucent. This I have seen in simple distentions of the gall bladder from obliteration or plugging of the cystic duct. In the normal gall bladder, however, the walls are quite thick, filled with blood-vessels, somewhat friable, and easily manipulated. The blood supply is derived from the cystic branch of the hepatic artery. The cystic artery itself is

of considerable size, at times as large as the radial. When cut, its branches, spreading over the surface of the gall bladder, give rise to considerable hæmorrhage.

After separation from the under surface of the liver by a dissection of the areolar tissue, the gall bladder remains attached only by the duct and artery and veins, nothing further being necessary in cholecystectomy except the application of a single ligature to the pedicle. It would be not only unnecessary, but impracticable to turn in the edges of the cystic duct to prevent the escape of bile.

The cystic duct varies in length from an inch to an inch and a half. In conditions of health it lies in shape a double curve, like the letter *s*. The diameter of the cystic duct is small. It is impossible to pass a probe through it into the common duct, not only on account of the shape of the double curve, but because the mucous membrane is made up of numerous transverse folds, each forming a sufficient obstacle to the passage of a blunt instrument. Even when the cystic duct is put upon the stretch it is impossible to pass any instrument whatever through it; after dilatation instruments of considerable size may be passed without difficulty. I have passed the forefinger often into the common and hepatic ducts through the dilated cystic. The cystic duct lies in front of and below the structures making the anterior wall of the foramen of Winslow. It is in relation with the cystic branch of the hepatic artery, lying in front and below. It is loosely connected with the other structures in this immediate region. At its point of entrance with the common duct it lies in front of the lower surface of the portal vein, from which it is separated by loose areolar tissue. Incisions into the cystic duct, either external or internal, should be made with great care and should be directed downward and outward. Incisions made backward and upward may wound either the cystic artery or the portal vein, or both.

The hepatic duct, made up of two large branches in the great fissure of the liver, proceeds obliquely downward and inward, to be joined about two inches from the great fissure with the cystic duct. It is much larger than the cystic, though not

so large as the common duct; the average diameter of this vessel is about a fifth of an inch. In chronic obstruction it may be dilated so as to admit easily the forefinger. The mucous surface of the hepatic duct is smooth, and presents no obstacle whatever to instrumentation. It is in close relation with the portal vein and with the hepatic artery. In all the dissections I have found the relations with the portal vein the same, the duct resting upon this enormous trunk. It is crossed by the cystic branch of the hepatic artery in some instances; in others the artery lies behind the duct. Incisions should be made, therefore, with the greatest care, and only after demonstrating the situation of the cystic artery. This may be done by exposing the artery or by recognizing its pulsations. All posterior incisions in the hepatic duct, as well as in the cystic and common ducts, are extremely dangerous, and no cuts should be made without seeing what is done; blind instrumentation on all these ducts must be very dangerous, owing to the close relations of the enormous main body of the portal vein. The main direction of the portal vein, hepatic and common ducts, and the hepatic artery, is the same—from the great fissure of the liver downward and toward the median line. The common duct, receiving the hepatic and cystic ducts about two inches from the great fissure of the liver, proceeds in an almost straight line to its communication with the posterior surface of the duodenum. In the beginning of its course the common duct lies directly in front of the portal vein. There is a slight deviation, however, from the parallel, the duct being inclined slightly less horizontally. The result is that the common duct is no longer in front of the portal vein when it enters the head of the pancreas. The duct is loosely connected with the surrounding parts by areolar tissue; it may be separated from the vein and from the artery with the blunt point of the closed scissors, or even with the fingers. Care must be taken, however, not to use sufficient force to tear the portal vein. Inferiorly, the common duct, before it enters the pancreas, crosses the inferior cava at an acute angle. The foramen of Winslow separates the structures in front from a portion of the inferior cava. After passing the foramen, however, the relation

is much more intimate. Above, the portal vein separates the inferior cava from the middle part of the course of the common duct. Between the inferior cava and the common duct there is loose tissue, which may be separated with the finger or any blunt instrument. The course of the common duct through the head of the pancreas may be demonstrated on the living after separating the reflections of the peritonæum already described. The mucous membrane of the common duct does not prevent instrumentation. Its size varies. At times, in normal condition, its diameter may exceed that of a common lead pencil, though it is generally smaller. The length varies according to the point of insertion of the cystic duct and according to the individual. The orifice in the duodenum admits the passage of a probe or director without much difficulty. Anatomically, the common duct may easily be exposed and incised, having cut through the peritonæum, by pulling the duodenum toward the median line. In this way the under surface of the duodenum is exposed, as well as the head of the pancreas, through which the incision may be carried as far as the posterior surface of the duodenum.

The relations of the colon to the gall bladder make it almost invariably possible to connect them. It is more difficult, at times, to bring the duodenum into easy contact with the gall bladder. A large and movable gall bladder, with a large and movable duodenum, makes the operation comparatively easy. A thickened and contracted gall bladder, with a small duodenum, makes the operation extremely difficult. At times the pylorus is very movable, so that it can be brought in contact with a small and fixed gall bladder. At other times it is very difficult to bring and keep them in contact.

*Operative Surgery of the Gall Bladder.*—Gall stones limited to the gall bladder being the most frequent occasion for surgical interference, cholecystotomy is the most common of the surgical procedures. In the normal condition of the gall bladder no operation could be simpler than this. Through the small exploratory incision I have recommended, the presence and position of the stones may be demonstrated. If the stones are limited to the gall bladder the wound should not be enlarged, for



there is great liability to hernia in an extensive scar. The gall bladder may be sewed into the wound and incised at once, or the opening may be deferred a day or two. The so-called ideal operation, which I have been able to perform but once, consists in opening the gall bladder immediately, removing the stone, inverting the peritonæum and closing the wound by the interrupted Lembert stitch. The gall bladder may then be dropped back into the peritoneal cavity. A somewhat safer way is to sew the fundus to the edges of the wound, after closing the cut in the gall bladder. This provides for the only danger by this method—giving way of the stitches and extravasation into the closed peritoneal cavity. This operation, with the suggested modification, I have performed once with very gratifying success. The convalescence was short and the cure has been permanent. This procedure, when practicable, is better than leaving the gall bladder open in the wound with permanent drainage. In one case of my own a permanent biliary fistula has resulted from the latter method. For several days after the operation the bile flow was carried on almost entirely through the cystic duct by siphonage. There has been, for a year and a half, a persistent biliary fistula, which is extremely annoying, though not in any way interfering with the patient's health. While in this case it is possible that there may be some interference with the bile flow, its abundant presence in the fæces shows that there is no material obstruction. Yet a second operation is necessary to close this annoying fistula. In this case the gall bladder was sewed to the edges of the fascia by so broad a margin that it will now be possible to separate its walls, invert them, and sew them together without opening the peritoneal cavity.

When the gall bladder is contracted so that the fundus cannot be brought in contact with the abdominal wound, immediate incision with drainage or total extirpation are the alternatives. This condition has existed in most of my operations for calculi. At my first operation of this kind, September 9, 1890, I placed a glass tube in the remains of the gall bladder and tamponed about this tube, and below the bladder, with gauze. Drainage was excellent by this method, and convalescence

became soon established. (Eventually the patient died of sepsis from retained gauze-sponge.)

The selection of method in cholecystotomy depends upon the importance given to drainage. It seems to me that drainage is desirable for a few days after operating upon the biliary passages. Not that siphonage is essential in all cases, for it is quite obvious that nothing is to be gained if the ducts are in a normal state. But in many cases one feels more secure in making provisions for possible extravasations.

Unless we extirpate contracted gall bladders, drainage must be resorted to as a matter of course, for it is impossible successfully to suture the ragged edges of the cut.

The method of drainage in these cases, which I have more fully described elsewhere,<sup>1</sup> is very efficient and safe. No complicated manipulations are necessary. The method first used by Abbe in 1889 of double glass drainage tube, with gauze packing for leakage, answers the same purpose admirably. Both methods are efficacious and successful in the treatment of deep wounds in the biliary passages, when suture is impracticable or inadvisable. In my later operations I have preferred rubber tubes to glass, on account of danger from pressure with the latter.

*Cholecystectomy.*—Extirpation of the gall bladder in certain cases is desirable. Where the walls are friable and contracted we may avoid extensive extravasations at the time of operations by tying off and removing the gall bladder entirely. This procedure should not be attempted unless the gall bladder can be easily separated from the adjacent structures. Besides lessening the dangers at the operation, this method shortens convalescence. Yet, even after extirpation of the gall bladder, drainage and gauze tamponage is necessary. As soon as the ligature becomes absorbed from the pedicle we may have a considerable flow of bile. It is unsafe, therefore, to leave the stump in the abdominal cavity without some provision for this expected flow, even after cauterization of the duct.

After the removal of an impacted stone, whether through

<sup>1</sup> Boston Medical and Surgical Journal, April 28, 1892.

the gall bladder, by dilatation of the cystic duct, or by incision of the common duct, it is advisable to establish siphon drainage in order to allow the inflammation of the mucous membrane to subside. Clinically I have observed that it takes some time for the bile to resume its natural channels, probably because there is an inflammation stenosis. Extirpation of the gall bladder has never seemed to me necessary but once. In that case the gall bladder had become so thinned and friable that the stone escaped through its walls during the operation. The torn remnants were separated from the liver and removed after ligature of the pedicle. A good recovery followed.

Convalescence usually is not protracted, even in cases of excessive biliary flow. As soon as the sinus becomes established the parts close in upon it on all sides, the long tract from the duct to the wound becomes obliterated early and its place is taken by a mass of cicatricial tissue through which it is impossible for the bile ever to break. Drainage, therefore, with or without entire removal of the gall bladder is followed by an earlier and more satisfactory cure than in those cases of cholecystotomy, where, after siphon drainage, the bile persists in escaping from a permanent sinus. After incision and drainage a contracted gall bladder becomes practically obliterated, and serves no longer either as a receptacle for bile or a quarry for stones. A complete obliteration of the gall bladder and the cystic duct takes place.

In malignant disease, total extirpation of the gall bladder is the only operation possible for permanent cure. Where the disease complicates the liver or any adjoining structure, cholecystectomy is unjustifiable unless the gall bladder contains stones; even then cholecystotomy, with subsequent suture or drainage, is a preferable operation.

*Operations upon the Cystic, Hepatic and Common Ducts.—*

There are few conditions of the cystic duct which admit of operative manipulation. In health it cannot be explored through the gall bladder. At times, however, a stone may become impacted in the duct and shut off from the gall bladder. In such cases, if it is impossible to dilate the duct through the gall bladder so

as to reach the stone, it will be necessary to incise externally. As in the hepatic and common ducts, a stone in this position may be crushed, care being taken not to bruise the walls of the duct enough to cause gangrene. Incisions into the cystic duct should be on the anterior and inferior surface to avoid the cystic artery above, and portal vein behind. Internal incision should be made in the same direction for the same reason.

The cystic duct, after apparent obliteration, becomes pervious at times as soon as the gall bladder is opened. This fact I have observed in several cases where, apparently, no bile had entered the gall bladder for a long time. At the end of twenty-four or forty-eight hours, in these cases, there has been an abundant discharge of bile through the tube left in the gall bladder. This interesting fact must be explained by the subsidence of the inflammatory stenosis caused by the long-continued irritation of these stones. One must always make provision for this flow, which at times is excessive.

Operations upon the hepatic duct and upon the common duct are indicated when stones become hopelessly impacted in either, and cannot be removed by dilatation of the cystic duct or by reasonable efforts at crushing. Care must be taken in both external and internal incisions to avoid the hepatic artery and the portal vein, as I have suggested in the anatomical considerations. After incising these ducts they may be closed by suture. The facility with which this operation may be performed depends somewhat upon the build of the patient, upon the thickness of the abdominal walls, the depth of the wound, the extent of inflammatory adhesions, the reflections of the normal peritonæum, and upon the conditions of the duodenum, stomach and colon. Even when the sutures have been applied with the greatest success and precision we must still make provision for the escape of bile.

More frequently than not it will be found impracticable to sew up the incised duct. A rubber or glass drainage tube should then be placed in the duct with siphonage, and the whole protected with gauze. This method, which may be applied almost universally, has many advantages, chief of which is the

transfer of the biliary flow, for the time being, away from the seat of the obstruction.

Not that it is always unnecessary to sew up the incisions in the common, hepatic and cystic ducts, but I should not do this when it is so difficult to apply the stitches that the operation will be materially lengthened. When it is possible to drain through the incision by means of a tube with gauze tamponage the results are quite as good as in suture. It may be impossible, however, to apply a drainage tube to an incision made low down in the common duct; for instance, where the duct is incised through the head of the pancreas. It might be possible with a proper curve to apply a glass tube to the common duct at this point. Whether it would be safe in cases of this kind to pack the wound with gauze, trusting to capillary attraction for drainage, I cannot say. It seems to me, although I have never had occasion to sew up the common duct, that it is essential in all such cases to put a tube into the duct. But in all cases where the duct is left without suture it is essential to leave a drainage tube. If a tube is inserted which approaches in size that of the duct, siphonage will remove the bile as fast as it flows toward the incision, and atmospheric pressure will collapse the duct upon the side of the tube. For two reasons, then, the escape of bile around the tube will be very slight, and this will be abundantly provided for by the gauze tampon, or well. This method of siphonage, however, is not always as efficient as could be wished, yet the results are the same. In many cases, siphonage proving insufficient, the bile has escaped entirely around the tube and has been sucked out by the capillary attraction of the gauze. No evil results have followed in any such case. In no case of operation upon the gall duct, bladder, or biliary passages, and in no exploratory operations, has death followed remotely or immediately the result of biliary extravasation. Provided the drainage, whether by tube or by gauze, can be made satisfactory, the cystic duct may be left to the processes of nature, like the urethra in perineal section.

In my earlier operations I used glass tubes for siphonage. In several instances there was evidence of ulceration by pressure. I therefore now use rubber tubing alone.

I have seen in many operations extensive extravasations of bile. The bile differs, under varying conditions, both in consistency, in color, and in innocuous or septic qualities. In cases of contracted gall bladder, where the cystic duct has been occluded for a long time, the bile is dark green, thick, viscid and tenacious, and often contains small and distinctly-formed calculi, flocculi and mucus. At other times there is, after chronic obstruction, an enormous flow of the bile which has been for a long time backed up in the radicals of the hepatic duct. In such cases large quantities are extravasated, and in spite of every precaution all the parts about the under surface of the liver are bathed in this secretion. Under these circumstances the bile is thin, non-tenacious and yellowish-green. In spite of the great extent of the extravasations and of the impossibility of removing entirely the fluid that covers the intestines, stomach and duodenum—some of which probably runs back through the foramen of Winslow—I have never observed in any case the slightest evidence of subsequent septic infection. It must be stated, therefore, from my experience, and I believe this fact is confirmed by the experience of most men, that bile is harmless when extravasated during the manipulations of an operation. The result, on the other hand, is quite different when through ulcerations the biliary passages have become perforated; and large quantities of bile escaped into the peritoneal cavity. In such cases we must expect the same fatal results which occur in perforations of the intestine. Yet it does not follow necessarily that a biliary extravasation will be fatal. In one case operated upon by Dr. Worcester, of Waltham (personal communication), the gall bladder had become ruptured and the peritoneal cavity was filled with bile. Some hours or days after rupture Dr. Worcester opened the abdominal cavity and bailed out the bile, and a satisfactory recovery followed. The fact probably is that, as in the urinary bladder, the bile occasionally contains colonies of septic bacilli. In such cases extravasation is followed by serious or fatal results, as in extravasations containing septic material elsewhere. At other times the bile is free from septic contamination, and its escape into the abdominal cavity is not followed by



immediately fatal results. The only case in my experience where a fatal termination has followed ulceration and extravasation, a gall-stone impaction of many years' standing resulted in a general peritonitis. In this case I advised an operation upon an impacted stone. The patient was not willing to undergo the operation, and lost her life.

That bile acts upon the peritonæum as an intense irritant, I have observed many times, for even with slight extravasations inflammatory adhesion-formation is very rapid and efficient—a fact proved by the invariable success following the use of gauze tamponage.

*Cholecystenterostomy.*—In chronic organic non-calculous obstructions between the liver and the duodenum we must expect a chronic and fatal cholæmia, unless we can provide artificially for the escape of bile either externally or into the intestine. The most interesting application of modern surgery lies in the operation of cholecystenterostomy. Physiologically an anastomosis between the gall bladder and duodenum would seem most desirable, and, when possible, it is to be preferred. Anatomically this is at times impossible, the local conditions preventing an easy approximation. Deviation of the bile-flow into the colon seems compatible with health, and is often more feasible than the duodenal route. Chronic obstructions of this sort are almost always accompanied by a dilatation of the gall bladder, so that approximations to either duodenum or colon are practicable. Junctionure with the duodenum is preferable when possible. The anastomosis may be made by the aid of Senn's plates or Murphy's buttons, or mechanical devices may be omitted altogether. The essential point is to have an opening large enough to ensure permanence. Abbe recommends one and a half inches.

The diameter necessary to give exit to the normal secretion is very small. I have seen vast quantities of bile escape through an opening in the skin no larger than a pin-head. The normal papilla has as small a hole. The contraction after anastomosis must, therefore, be practically complete to arrest the natural daily flow.

If the gall bladder for any reason cannot be used for anas-

tomosis, the common duct may be isolated, under favorable conditions, and inserted through a slit into the side of the duodenum. This, as far as I know, is a theoretical procedure, but anatomically possible, even easy. It is inapplicable unless the obstruction is situated in the pancreatic portion of the duct.

Operations upon the common duct by way of the internal surface of the duodenum may be practiced under very exceptional circumstances, as in McBurney's case of gall stone impacted near the duodenum (removed by incision of the duodenum and subsequent suture, with recovery). In one case (J. W. Elliot's, unpublished) the obstruction was caused by a cicatrix at the papilla. Anastomosis is certainly preferable on all grounds to enterotomy in similar cases.

Obstructions situated in the hepatic above the point of junction with the cystic admit of no relief, except occasionally by the formation of a fistula, though theoretically the duct above the constriction, if long enough, might be inserted into the gall bladder. Even after external drainage it is doubtful whether the long sinus would remain patent.

The prognosis after simple explorations is good, but we must bear in mind that there is a very considerable mortality in advanced organic disease.

After cholecystotomies, extirpations and operations upon the ducts, recovery takes place in a very large proportion of cases. In my fourteen cases, including all methods of gall-stone extraction, I have had two deaths, one from an avoidable sepsis and the other from hæmorrhage. In six exploratory operations in which cancer was found there were two deaths.

In most of my cases, whether exploratory or completed, there has been a marked and long-continued jaundice. In none has hæmorrhage been an important factor at the operation itself, and in but one has there been a secondary hæmorrhage. I believe that hæmorrhage is a real danger in cholæmia, but its frequency and importance is much exaggerated.

## THE RESULTS OF PARTIAL AND COMPLETE OCCLUSION OF THE URETERS.

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FROM the writer's observation in practice and literature, it is probable that the ureter is occluded by ligature about three times in every 100 cases of vaginal or abdominal hysterectomy. The ureter may be tied for a few weeks, when, by the giving way of the ligature around the ureter, the kidney may naturally resume its secretion. It is more probable that the ligature will yield a little so that the ureteral lumen will be partially reopened, allowing the urine to flow through to a slight extent. Another method will be that the ligature will cut through the ureter, and a urinary fistula will follow. The writer is now fully convinced that many a ureter is tied off during the hysterectomy without the operator or patient having knowledge of it. It also appears to me that many of the deaths, especially in vaginal hysterectomy and some in abdominal hysterectomy, are entirely due to accidental ligature of *one* or *two* ureters. The ligature of one ureter in itself would not kill, but the very ureter leading to her best kidney may be ligated, and the patient is unable, with one kidney, containing deficient secreting apparatus, to withstand the emergency of the severe operation. The writer once witnessed a post-mortem on a woman in Vienna, where vaginal hysterectomy had been performed two days previously. The autopsy revealed one ureter tied, and as to the fate of the other ureter it was impossible to find out, but it was supposed to be intact. Now, in this case, it is probable that the kidney con-

taining the main secretory power was made useless to the patient by occluding its ureter with a ligature. The other kidney being deficient in secreting substance, was unable to tide the woman over the ordeal of the trying operation. Deaths in hysterectomy have frequently appeared to me suspicious of something else than sepsis or shock. Death sometimes occurs with no apparent pathological cause, except that in some way or other the kidneys have been injured. Of course, it must never be forgotten that women, who have abdominal tumors, are very frequently diseased in the kidneys. In fact, autopsies on women who die from ovarian tumors as the result of operation for their removal, show chronic kidney disease in 75 per cent. of cases. Especially will a uterine myoma induce kidney disease by its irritation being emitted along the hypogastric plexus to the abdominal brain, where the forces are reorganized and transmitted to the kidney. The irritation on the kidney causes (a) increased secretion; (b) decreased secretion, or (c) disproportionate secretion. The result is renal vascular changes ending in tubular nephritis or interstitial nephritis. Abdominal and pelvic tumors cause fatty degeneration of the heart. Abdominal and pelvic tumors cause fatty degeneration of the liver. Pelvic tumors frequently cause partial or complete occlusion of the ureters inducing hydro-nephrosis. It may then be expected that any woman requiring hysterectomy may be already suffering with kidney disease. So that all possible means should be employed to prevent any disaster from ureteral occlusion. It is estimated that each kidney contains 250,000 Malpighian tufts and seven miles of tubes. But disease may easily obliterate thousands of tufts and miles of tubes without giving evidence in which kidney the destruction exists. One kidney may be larger than the other, one may be absent. From a few of the above suggestions it is plain that the surgeon should be alert as to the ureters in hysterectomy.

From the importance of the subject to the gynæcologist, the writer undertook experiments on dogs' ureters in order to secure more definite knowledge of what became of a kidney when its ureter was ligated partially or completely.

The subject developed under several heads, as regards the

results on the kidney: (1) When the ureter was occluded by ligature completely and forever. (2) When the ureter was partially occluded by ligature. (3) When the ligature cut through the ureter and the kidney resumed secretion.

Under another heading came the idea of what to do with a severed ureter. The following plan may be adopted: (a) Place the ureter in the abdominal wound. (b) Put it in the small intestine. (c) Put it in the large intestine. (d) Ligate it completely and stitch it to the wound or drop it into the abdominal cavity. (f) Extirpate the kidney. (g) If the ureter be divided close to its entrance into the bladder, it may be inserted into the top of the bladder by drawing the fundus of the bladder toward the kidney, and fixing it by sutures, so that the ureter would not be torn out during the emptying of the bladder or systole.

Ten experiments were performed on the ureter with the following results:

(Dr. J. F. Percy, of Galesburg, Ill, shared in six of the experiments.)

EXPERIMENT NO. 1.—Dog, weight fifteen pounds. Dr. Percy performed enterorrhaphy according to the author's stove-pipe method. I then ligated the right ureter with Barber's linen thread, No. 40, by pushing an aneurism needle through the peritonæum, then around the ureter, and out through the peritonæum, and tying the thread. All the experiments were done by abdominal incision or by tying the ureter through the peritoneal cavity. The dog died of shock in twenty-six hours. The ureter was found full of urine. The ureter and kidney pelvis was so tensely full that the most delicate fluctuating wave could be produced by percussion. One would scarcely believe that a ureter could withstand such high pressure without rupture. The urine pressure was, no doubt, then above blood pressure. The ligation of the ureter in this experiment was simply secondary to the intestinal experiment which killed the dog. The ligation of the ureter, it is thought, had no cause of death in it.

EXPERIMENT NO. 2.—Dog, weight fifty pounds. Dr. Percy performed gastro-enterostomy with segmented rubber plates. I then ligated the right ureter with linen thread. Dog died in three days from fæcal fistula at site of operation, due to *crossing*

the threads while tying them. The mistake caused the dog's death. In this case the ureter was ligated so loose that the lumen was only partially occluded and the urine trickled through. The right kidney was slightly larger than the left. The second error in this experiment was made by myself. I really thought I had tied the ureter sufficiently tight to occlude its lumen, but the autopsy proved otherwise. It plainly shows that *experience* is required in all abdominal surgery. Even three days of partial occlusion of the ureter had slightly enlarged the kidney—in short, had made a slight hydro-nephrosis. This is a suggestive lesson as to what abdominal and pelvic tumors may do.

EXPERIMENT NO. 3.—Dog, weight fifteen pounds. Dr. Percy performed ileo-ileostomy with segmented rubber plates, completely severing the gut. I then tied the right ureter and closed the abdomen. Dog died in some fifty hours. Autopsy revealed the cause of death to be faecal fistula. To my astonishment I found that I had not ligated the right ureter, but the right spermatic vein. Both Dr. Percy and myself felt sure that it was the ureter which passed over the aneurism needle. But I learned how the mistake was made. When the spermatic vein was pulled up it was kept on a stretch, and the dark venous blood did not flow through it while we kept it stretched, and then it appeared white and just like the ureter. Had I let the vein loose the blood would have coursed back through it, and it would have told its own tale. But yet, the mistaking the spermatic vein for the ureter has been made, and it is a blunder that may happen to the most elect.

EXPERIMENT NO. 4.—Dog, weight twelve pounds. Dr. Percy did circular enterorrhaphy according to Dr. Carnnell's method. I then tied the ureter. Dog died in three days. The autopsy revealed that the death was caused by (a) faecal fistula; (b) the abdomen contained a considerable quantity of urine. The linen thread had cut into the ureter and allowed urinary leakage. It may be here stated that the deaths from intestinal operations must not be in any way related to the ligature of the ureter. They were separate labors for other objects.

EXPERIMENT NO. 5.—Dog, female, weight fifteen pounds. Dr. Percy performed ileo-ileostomy with segmented rubber



plates, completely dividing the gut and applying an unsevered graft. Then with the aneurism needle I ligated the right ureter with Barber's linen thread, No. 40. The dog recovered well and appeared healthy and happy, eating and drinking. At the end of a month she began to lose a little flesh, but that was likely from close confinement in a small cage. At the end of six weeks she took a severe distemper, that then raged among dogs, and suddenly died. Autopsy revealed the anastomosis well healed, but the bimuscular fistula had contracted to one-fourth of its original size, so that it was quite small at the end of six weeks. It had a lumen of about a third of an inch. The result of the ligature on the ureter was the following: The kidney was about three times the size of the other one. The ligature on the ureter had yielded a little, and the urine trickled through some. Six weeks of partial occlusion of the ureter had produced hydro-nephrosis. Had the occlusion been complete, the kidney would have atrophied.

EXPERIMENT No 6.—Dog, weight twenty pounds. Dr. Percy performed circular enterorrhaphy. I then tied the right ureter with linen thread (Barber's No. 40). The dog recovered, and he was kept for six months in a small cage. At the end of six months he was suffering from marasmus, probably on account of the close confinement. However, he ate and drank well. He was killed at the end of six months. The circular enterorrhaphy was well healed, but contracted to one-third of its original size. The right kidney, whose ureter was ligated, was shrunk to the size of the first joint of the thumb. It had shrunk to one-fifth of its original size. There was no trace of the ligature, except a white circular cicatrix around the ureter. The other kidney was slightly larger than normal. Complete absorption of the ligature had taken place. Complete occlusion of the ureter had produced atrophy of the kidney. We were not able to state whether the dog urinated more or less urine than at other times. In this case the kidney had secreted until its pelvis and ureter were full and up to blood pressure. Then the pressure had prevented further secretion and the glomeruli gradually shrank. The atrophy of this kidney was enormous for six months. It shows how quickly an organ will die if it is not used.

CONCLUSIONS AND RESULTS.

(1) Complete occlusion of the ureter produces atrophy of the kidney (in my experiments in a few months).

(2) Partial occlusion of the ureter produces hydro-nephrosis. The kidney cavity dilates and its walls thin.

(3) The kidney will bear complete occlusion for some weeks, and then resume its function after the obstruction and pressure are removed. The resumption of kidney secretion after weeks of complete obstruction will occur. I know of a lady whose ureter was ligated for six weeks, after which secretion resumed on removal of the ligature.

(4) The urine secretes until the pressure of the secreted urine is higher than blood pressure. The high pressure prevents circulation in the glomeruli.

(5) The ligature is apt to cut through the ureter wall and produce a urinary fistula.

(6) The ligature on the ureter is very apt to yield a little and allow the urine to trickle through in such cases and in hydro-nephrosis. Two ligatures should be thrown around the ureters at some distance from each other.

(7) It is probable that three ureters are tied in each 100 cases of hysterectomy.

(8) No doubt many ureters are tied and no knowledge of it exists.

(9) Severed ureters should not be put into the small bowel, as active peristalsis prevents healing. With me four carefully performed experiments of putting the ureter into the small intestine proved fatal from peritonitis.

(10) It has been asserted that the irritation of a ligature on one ureter will produce suppression of the secretion of the other kidney. Experiments disprove this assertion. When a patient dies from ligature of one ureter it is likely the other kidney is defective from disease and not reflex action.

(11) Man has double the amount of kidney required for ordinary use, but when an emergency arises he needs both kidneys. A man with one kidney is apt to die with pneumonia or other acute diseases.

# ON THE FEASIBILITY OF INTRAPERITONEAL CYSTOTOMY, WITH THE REPORT OF A CASE.<sup>1</sup>

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THE interior of the bladder is ordinarily reached in one of three ways:

By the urethra;

By the perinæum in the male, and by the vagina in the female;

By the suprapubic incision.

All of these methods are imperfect, and give the surgeon only a limited view of the bladder. If we wish to demonstrate the bladder on the cadaver in the clearest possible manner, we do it by laparotomy.

If the bladder be distended, its superior surface presses against the anterior abdominal wall like the pregnant uterus.

In the Trendelenberg position, with an incision from the umbilicus to the pubes, we get a clear view of the unattached portions of the exterior of the bladder.

If, having thus opened the abdominal cavity, a median incision be made in the most prominent part of the bladder wall, extending backward from two to three inches, we are able by means of retractors to see the interior of the bladder very perfectly. The prostate, tumors and, if it be necessary, an entire section of the vesical wall can be removed with ease. The ureters can be seen and examined advantageously.

The superiority of the intraperitoneal over the suprapubic

<sup>1</sup> Read before the Obstetrical Society of Boston, June 10, 1893.

incision, as a means of reaching and operating upon the interior of the bladder, is very decided, and were there no question of safety to the patient, the former incision would always be used. The suprapubic incision is necessarily of limited extent, and the bladder and abdominal walls are closely united being, in fact, a part of the same incision. The control of the bladder is imperfect, the thick abdominal walls obstructing both sight and manipulation.

Through the peritoneal incision the cut edges of the bladder can be drawn up toward the surface and even outside of the abdominal walls.

With the finger in the rectum, the prostate or any portion of the base of the bladder can be lifted to within an inch or two of the external opening. By repeated trials upon the cadaver, it has been found that the bladder may be sewed up intra-abdominally, so that it resists much distension, both by water and by air. The history of laparotomy is full of reports of accidental incision of the bladder, where suturing has been necessary. The reported results of these accidents are almost always favorable. The treatment of penetrating wounds and rupture of the bladder has been successful. The chief objection to intraperitoneal cystotomy must be the danger, or seeming danger, of septic infection. It is doubtful if the danger be as great as it has been supposed to be.

The stomach, the gall bladder and the intestines (all having septic contents) may be opened and closed with safety.

The uterus and the kidneys are removed through the peritoneal cavity because of the greater advantages of this route. Why then should the bladder not be approached by the route which affords the greatest facilities?

The opening of the abdominal cavity, the escape of the urine and the imperfect closure of the bladder after operation are dangers which present themselves to the operator's mind.

With proper care it is probable that the bladder can be as certainly shut off as the stomach or intestines. Normal urine is not septic as it enters the bladder. The danger from an alkaline urine in contact with healthy tissues for a short time is not great.

The flow of urine through the ureters is, as a rule, by drops, and can be easily taken care of by an assistant with sponges.

About the bladder a packing of gauze may be so placed that much urine might escape without soiling the peritonæum or intestines. Experimentally, it has been found that more than two ounces of permanganate of potash solution may be poured into such a packing at one point without staining through.

Intraperitoneal cystotomy may be performed for tumors of the bladder, for enlarged prostate, for disease of the ureters, for cases of stone in the bladder of great size and for sacculated stone.

It must be remembered that cystotomy of any kind is undertaken only in cases of great gravity. There are advantages in the operation which certainly, at times, render it preferable to suprapubic cystotomy. It should be remembered that the mortality of this latter operation is not small.

The writer makes the following suggestions for the performance of intraperitoneal cystotomy: Prepare the patient as for ordinary laparotomy; wash the bladder, if the urine be foul, for several days with a saturated solution of boric acid; distend the bladder gently with this solution at the time of operation; make the abdominal incision from the umbilicus to the pubes, being careful not to open the prevesical space.

The intestines should be drawn out of the pelvis and the cavity packed with strips of sterilized absorbent cotton covered with gauze, the patient being in the Trendelenberg position. An incision in the median line of the bladder, beginning an inch from the junction of the abdominal and vesical peritonæum, should be extended backward from two to three inches.

The incision should at first only include the peritoneal coat, which should be dissected from the muscular coat for a quarter of an inch on either side of the incision. The fluid should now be withdrawn and the incision carried through to the cavity of the bladder. Bleeding may be controlled by hæmostatic forceps.

Having performed whatever operation is necessary upon the interior of the bladder, and having the hæmorrhage under control, the bladder may be closed. The method of closure should be by continuous suture of the muscular coat, the stitches being closely applied.

These stitches should not include the mucous membrane, They should be of silkworm-gut or of silk. The peritoneal coat of the bladder should then be closed by a continuous "right angle", or by "Lembert" suture.

This gives a double row of stitches. The continuous stitch prevents stretching of the bladder wall when it is distended, and is a safeguard against leakage. Should there exist a bleeding within the bladder, which threatens to interfere with micturition permanent drainage can be made through the perinæum, through the vagina or by the suprapubic route.

The intraperitoneal operation does not interfere with suprapubic drainage, should drainage be necessary. As a rule, however, drainage will not be necessary except that which can be obtained by the urethra.

The packing should now be removed from the pelvis and from about the intestines. The pelvic cavity should be wiped out with moist aseptic gauze and the abdominal wound closed. The bladder should be washed gently with boric acid solution two or three times a day, care being taken not to distend it nor to allow it to become distended with urine.

*A Case of Intraperitoneal Cystotomy.*—Mrs. B., twenty-eight years of age. Mother of five children.

For nine months the patient had been suffering from hæmorrhagic cystitis. It began without apparent cause, with the symptoms of blood in the urine and an increased desire to pass water. This condition grew gradually worse until the bladder would not hold its contents, night nor day, for more than twenty minutes. The urine became more and more mixed with blood and small bits of calculi. The suffering was constant and extreme.

The patient was blanched and very weak from loss of blood.

Under ether the urethra was dilated and the finger introduced into the bladder. It was contracted, the mucous surface being very irregular and covered with incrustations. The feeling was of new growths covered with urinary deposits. The bladder was very thoroughly curetted and large quantities of material were removed. The hæmorrhage was considerable.

Dr. Wm. F. Whitney reported, on microscopic examination, that only mucous membrane of the bladder and phosphatic deposits were found.



After the operation the bladder was washed twice a day with antiseptic solutions. There was a decrease in the amount of blood for a short time, but the hæmorrhage soon returned, notwithstanding the constant washing of the bladder. Four months later the condition of the patient was worse than before. She was admitted to the Massachusetts General Hospital, where, by the kindness of Dr. John Homans, she came under my care.

The urine was ammoniacal, contained much blood and was full of sediment. She suffered constantly, was miserable from loss of sleep and pallid from loss of blood. It seemed necessary to take some radical measures to relieve the distressing condition. Intraperitoneal cystotomy was decided upon and performed in the manner previously suggested. The operation afforded great freedom for manipulation.

The bladder wall was half an inch thick, but there was no troublesome bleeding. There was no difficulty in keeping the cavity free from urine.

The mucous membrane was studded with ulcerations and with grayish-white patches in which were firmly adherent urinary deposits. The entire surface of the bladder was curetted with a sharp curette. In places it was necessary to use the knife or scissors in order to reach healthy tissues.

It was thought best, as there was considerable oozing, to make an opening for free drainage into the vagina.

The muscular coat of the bladder was first closed then the peritoneal. When the packing in the pelvis was removed the peritonæum was found quite dry. The abdominal wound was closed in the usual manner. The bladder drained well through the vaginal opening and the urine soon became clear and abundant. After the operation the patient was troubled with nausea, and at one time had a very rapid and weak pulse, but otherwise made an excellent recovery. Four months after the operation the patient is in excellent condition and able to be about her housework.

The opening in the vagina has almost closed. The urine is free from blood.

Dr. Whitney's report is as follows: "The specimen consisted of blood clots and numerous small fragments, all but one of which consisted of masses of lime salts, incrustated on what seemed to be portions of the lining membrane of the bladder. One piece, larger than the rest, the inner surface of which was irregularly thickened and incrustated with lime salts, was composed of the muscular wall of the bladder largely infiltrated with round cells."

REPORT OF A CASE OF REMOVAL OF A MALIG-  
NANT POLYP SPRINGING FROM THE BASE  
OF THE SKULL, IN WHICH AN ATTEMPT  
WAS MADE TO PRACTICE SENN'S  
PROPOSED METHOD OF REN-  
DERING THE OPERATION  
BLOODLESS.<sup>1</sup>

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SPRINGER, aged thirty, entered the Buffalo General Hospital in October, 1892, with a case of very rapidly growing malignant tumor, completely filling the pharynx, evidently pressing down from above, pushing down the soft palate, involving the fauces and tonsils especially on the right side, and completely occluding the nasal passages. Its lower border could be seen presenting behind the border of the soft palate. Dyspnœa was extreme, and all his bad symptoms were rapidly becoming aggravated. He could only swallow soft diet, and could scarcely articulate. His case was considered as one of malignant tumor, probably fibro-sarcoma, with an excess of sarcomatous elements, springing from the base of the skull. The patient fully appreciated his desperate condition, and solicited operation at whatever hazard, stating that he preferred death on the table to a lingering death from his disease.

At his request and full assumption of all risk, operation was undertaken in clinic, under chloroform, on the morning of October 15, 1892. Fearing accident during the administration of the anæsthetic, I had it administered upon the operating table before the class, and not in the ante-room, as is customary. Before complete anæsthesia was obtained he became cyanosed, and would have suffocated had I not had ready for use and used a large curved tube of the

<sup>1</sup> Read before the American Surgical Association, May 31, 1893.

Bigelow evacuator, by which I was able to let air pass into the larynx. So soon as he was asleep I exposed the trachea, but before opening it I had again to resort to the long tube. This was done because it was easier to slip this under the epiglottis and into the larynx than hastily to insert the trachea tube. I then with ordinary effort opened the trachea, and placed the tube in position, after which he breathed without difficulty.

Previous to undertaking the operation, in considering its feasibility, I recalled the experiments of Senn. He reported a number of successful experiments upon animals in isolating the trachea, and passing a rubber tourniquet around the balance of the neck, making the constriction so tight that all blood supply to the head, save that through the vertebral artery, was cut off. Senn's experimental efforts, according to his report, had been so satisfactory that without knowing whether any one had successfully repeated them upon the human subject, I decided to attempt the method in this case.

Accordingly, after making the tracheotomy, I isolated the trachea, pulled it forward, passed around the neck and back of it the ordinary Esmarch tourniquet, and constricted it so tightly that all pulsation of the vessels in the head and neck ceased. After this I raised the cheek by incision similar to Langenbeck's for excision of the upper jaw, and found that while no artery spurted, venous hæmorrhage was excessive. As quickly as possible I resected the upper jaw, and found the antrum and nasal cavities filled with the soft mass of the tumor. While trying to remove this material the patient several times stopped breathing, and it required a few attempts at artificial respiration to cause him to resume it. Finally, when I had the growth nearly removed, there was complete cessation of breathing, and all other efforts had to be discontinued while we endeavored to provoke return of normal respiration. To this end the patient was inverted and all sorts of artificial stimulation resorted to, while rhythmical motions of the arms and alternating compression of the chest were kept up. For forty-five minutes, actual time, we worked in this fashion, intermitting efforts occasionally for a few seconds to see what progress had been made. The action and regularity of the heart scarcely altered during this time, the pulse only becoming weaker when for a few seconds the artificial respiration was stopped. We found that the only way to keep the heart going was to make him breathe, and it was a great relief when at the end of the above-mentioned time it was found that his heart would beat steadily and

continuously, and that he would breathe when left alone. It should be mentioned that shortly after this phenomenon first appeared, constriction about the neck was relieved and the rubber band removed. When at the conclusion of this time pulse and respiration had become again fairly normal, though weakened, the original operation was resumed, the tumor cleared out from the naso-pharyngeal cavity, the source of origin, *i.e.*, the lower surface of the body of the sphenoid, cauterized, the cavity packed with gauze, and the wound closed in the usual manner. At the close of the operation he left the table apparently in as good condition as when brought in. The patient died the next morning of shock, there apparently having been no bleeding more than a trifling oozing in the meantime.

During the efforts at resuscitation I was materially assisted by Drs. Phelps and Parmenter, who assumed a large part of the exhausting work.

I believe the case worthy of report because, so far as I know, it is the first in which such an attempt to make bloodless this terrific operation has been attempted upon the human subject, and because, in the second place, there was exhibited the most singular phenomenon, which I have described, in that the heart apparently suffered very slightly from pressure upon the pneumogastrics while the function of respiration was for a period of three-quarters of an hour almost entirely lost, and this presumably from pressure upon the same nerves along with the phrenics.

## REPORT OF CASES OF OPERATIVE RELIEF OF ENDOCRANIAL HÆMORRHAGE.

By W. H. HUDSON, M.D.,

OF LAFAYETTE, ALA.

**T**RAUMATIC endocranial hæmorrhage, when severe enough to produce symptoms, demands operative interference in every instance. Although some few still hold that when the hæmorrhage is so small as to produce only light symptoms, no operation should be done, I think that in view of the very serious damage that may result from any pathological condition within the cranium, every hæmorrhage, however small, if sufficiently large, and so located as to produce diagnostic symptoms, should be removed.

The removal of extra-dural hæmorrhage is attended with very little danger if there has been no serious brain injury resulting from the same cause which caused the hæmorrhage.

Profuse hæmorrhage from the middle meningeal, or its larger branches, or the larger cerebral arteries, may demand interference to save life. In this case, of course, any operation would be justifiable.

While it is yet impossible to say whether a hæmorrhage is intra- or extra-dural—and while the operation for hæmorrhage without the dura is much less serious than one within—nevertheless the operation for intra-dural hæmorrhage, where the brain has received only a small injury—is fairly devoid of danger; and the only difficulty attending the removal of the clot appears to be the hæmorrhage from the injured vessel. But this seems to have been readily controlled in most of the cases in which operations have been made.

This, of course, refers only to such as have been operated on very soon after the reception of the injury. And, as far as I

know, Case No. I, reported below, is the only one in which an operation has been done within so short a time after the hæmorrhage begun; and the only one sub-dural in location in which there was no indication of traumatism upon the skull itself.

The two cases described below have been seen and operated upon by myself within the last two years.

CASE I.—*Injury of Head; no Scalp Wound; no Fracture; Paralysis of Right Side; Large Intra-dural Clot on Left Side of Brain. Operation. Recovery.*—September 26, 1891; A. M., aged twenty; laborer; large and stout; right-handed; after having been struck on his head with a large stick was seen to stagger, but not fall; he then walked fifty or sixty yards, and sat on a low fence; he did not speak, and appeared dazed; after a few moments his head was seen to turn violently to one side, and, at once, he had a general convulsion; water was poured on his head, and in a short time the convulsion disappeared; he was then carried toward a house near by; he now could not walk alone, nor speak; on the way he had another convulsion, which lasted longer than the previous one; on its disappearance he was much more helpless, and in a much worse condition than before.

He was now lifted bodily, carried into the house, and placed on a bed. I saw him an hour later, and found him lying on a bed with his legs slightly separated, and his arms lying out from his side. His pupils were slightly dilated—the left somewhat more than the right; they reacted slightly to light; his pulse was fifty to the minute, and full; his respiration was ten to the minute, and stertorous; his left arm and leg moved occasionally; his right leg was movable, but soon ceased to beso; the right face and arm were paralyzed; loud calling provoked no response; the temperature was not taken, but the skin felt cold, and was covered with slight perspiration; an examination of the head showed no fracture and no injury of scalp; had head shaved at once, and still found no evidence of injury; head was carefully washed with soap, afterwards with ether—and a towel wet with one to twenty carbolic acid solution applied; this was kept saturated for about two hours—all symptoms growing worse; pulse went down to forty-four per minute; respiration to eight; the coma deepened; the right face, arm, and leg were completely paralyzed; the left arm and leg were moved occasionally, but movements became less marked.



Death seeming imminent I proceeded to operate, having the assistance of Drs. Rea, Holmes and Kirby. With every precaution preparations for the operation were made. All instruments were sterilized by heat—so were the silk ligatures, towels, and sheets.

Solutions of carbolic acid, bichloride and Thiersch's solution, were made from sterilized water. The head was rewashed in 1 to 1000 bichloride solution, and the sterilized sheet, wrung out of the same solution, was fastened around the neck.

I had decided to open the skull in such a way as to expose the



FIG. 1.—Showing location of clot in Case I.

arm centre. The fissure of Rolando had been marked off on the scalp immediately after the scalp was shaved according to the Thane-Horsley method. A small nail was driven through the scalp to mark the skull. A large horse-shoe flap was made, with base forward and downward. After the flap was raised the first evidence of traumatism was seen. The periosteum was detached over a portion of skull somewhat larger than a quarter of a dollar just posterior to the coronal suture, represented by the upper border of the inside ring of Fig. 1. The inner ring also represents the opening made in the skull.

The presence of this evidence of injury decided me to trephine there instead of over the arm centre. The trephine was three-quarters of an inch broad, and I had decided beforehand to make three or four openings and saw them into one. The trephine at first was applied to the upper part. The bone was very hard and thin, and bled very little. There was almost complete absence of *diplöe*. When the first button was removed there were no signs of extradural hæmorrhage, but the dura bulged into the opening, was discolored and exceedingly tense, and did not pulsate. I was satisfied that I was upon the clot. Another trephine opening was made just below the first, the upper margin of the trephine cutting the dura. The intervening piece of bone was rapidly cut away with bone forceps. Small particles of blood clot were forced out through the opening made in the dura by the trephine.

The opening in the dura was enlarged with curved, blunt-pointed eye scissors, and a large amount of blood, not very firmly coagulated, came out. The nozzle of a fountain syringe, sterilized, was introduced into the opening of the dura, and the rest of the clot washed out with a gentle stream of Thiersch's solution. I estimated the amount of blood to be between three and four ounces, possibly more.

The hæmorrhage was from a branch of the ascending frontal artery, which was secured after some little difficulty, and ligated with catgut, the point of rupture in the artery corresponding with the dot in the central ring of Fig. 1. This was at the lower border of the portion of skull from which the dura had been loosened by the blow.

The wisdom of making the opening through the skull at this place was shown by the result; for, it will be seen, that the point of hæmorrhage would not have been revealed had the opening been made immediately over the arm centre, unless it had been made very large, which is not necessary if the bleeding artery can be found through a smaller opening.

I took one stitch of catgut into the free border of the dural incision, leaving three or four strands of sterilized silk on either side of the stitch. These I brought out of the lower border of the flap with the other drains.

The patient was examined at this stage of the operation. Breathing and respiration were much increased. The flap was sewed in place with long silk threads, which were tied in bow-knots and left long, so as to allow reopening, should this be necessary, without the necessity of making new stitches. A piece of iodoform gauze, wrung

out of a 1 to 2000 sublimate solution, was placed in the lowest border of the wound for drainage. Several layers of iodoform gauze, wet with the same solution, were applied on the scalp; several layers of sublimate gauze over this, firmly fixed by bandage, completed the dressing.

According to my most accurate estimate the distribution of the hæmorrhage was about as shown in the large circle on Fig. 1.

At the close of the operation the patient's pulse was a little less than 100, and respiration about twenty per minute; otherwise his condition appeared unchanged. No anæsthetic was used during the operation. The patient was placed comfortably in bed and allowed to remain until late in the afternoon, when, without my knowledge, he was carried on a litter to his home, a distance of half a mile.

His temperature at nine o'clock P.M. was  $99\frac{3}{4}^{\circ}$ ; pulse and respiration little changed. He had not spoken, nor had any movements been seen. Later at night his left leg and arm were moved occasionally, but the right side was still paralyzed. He had not spoken since the injury.

September 27.—The symptoms appeared better. Some movements of right leg and arm had taken place. His urine had been drawn with catheter. Would open his eyes when spoken to loudly, but did not speak nor seem to understand what was said to him. The dressing was saturated with blood and cerebro-spinal fluid, but was not changed. Later in the day the patient grew nervous and restless; was able to swallow, and some bromide of potash was given him. Urine was passed voluntarily, but the pulse and respiration remained about the same; temperature  $99^{\circ}$ .

September 28.—Could speak, using monosyllables; seemed to understand when spoken to; wanted to sit up and did so while head was dressed; bowels moved. The strip of iodoform gauze and silk threads were removed; with them came more than half an ounce of blood, mixed with cerebro-spinal fluid. The dressing was made as before, with a strip of gauze replaced at the lower border of the incision. The recovery from this period was uneventful. The temperature never went above normal after the first dressing.

On the fourth day after the operation he was able to walk about in the room; his speech had improved, and the paralysis of his right side was rapidly disappearing.

On the fifth day all the stitches and the gauze drain were removed. The union was perfect except at the point of drainage.

There had ceased to be any discharge, except a small amount of transparent fluid. Head was dressed as before and the patient continued to improve.

On the eleventh day after the operation the dressing was replaced by a warm cap for protection and the patient was dismissed, able to walk. His speech had become almost natural, and the hands only in the finer movements showed the effect of the previous paralysis. The patient later resumed his occupation as a laborer, and now (1893) states he feels no inconvenience whatever as a result of his injury.

CASE II.—*Paresis of Right Arm and Leg; Partial Word Blindness and Agraphic Faults; Extra-dural Hemorrhage Over Left Side of Brain. Operation. Recovery.*—G. R., aged fifteen years; quite large for his age; school boy; right-handed; was struck a severe blow on his head by an adult man. He fell to the ground, but got up and walked toward the house, accompanied by several small boys. After going some distance, probably a mile, "he fell down and shook all over." After some time he recovered, but found he could only walk with difficulty. With the aid of his companions he was enabled to reach the home of his uncle, where he spent the night.

March 27, 1893.—Dr. B. F. Rea, Jr., was called to see him. He found him in bed, fairly comfortable; his mind was apparently quite clear; he was able to talk and to explain the occurrence of the day before with the exception of the spasm, of which he had no memory.

At the invitation of Dr. Rea I saw him later. I found him in bed comfortable, except for an occasional paroxysm of severe headache, the right side of head being the most painful. There was no paresis of face; the eyes were natural, but the right arm and leg were paretic.

I examined his head carefully, but could find no evidence of fracture, although there was a little thickening of the scalp over the right occipital bone, of which he complained, and over the left parietal bone, near the median line of the skull, and just posterior to the upper end of the fissure of Rolando was another spot of thickened scalp, which gave pain only on deep pressure. The grasp of the right hand was less than half that of the left. The pain sense while not destroyed was greatly inhibited. The temperature sense was somewhat interfered with. His arm could be moved, but none of

the delicate movements of fingers, hand or forearm could be made. He could not tell the difference by touch between my silk handkerchief and the woolen blanket on his bed. A half dollar put in the palm of his hand he called a dollar. He said a wooden dumbbell, weighing half-pound, weighed about five pounds. The right foot, toes and leg were somewhat more paralyzed than the arm. The other senses were in nearly the same condition as in the arm.

He was able to read, but I thought with some difficulty, and he said he was not able to read at all; but on giving him a book he succeeded in reading, but with evident difficulty. His eyesight was otherwise normal. When told to write he could not do it, but made figures, as well as could be expected, with his left hand. When directed to walk he got up on the side of the bed, and, after fixing himself, was able to drag his right leg across the room with the aid of some one at his side, his arm hanging loosely.

These conditions of mental disturbance lasted longer than the paresis, his muscular sense being the last to be completely restored.

At my first examination, made two days after the operation, he read quite easily, but still claimed that he could not write; but did succeed in writing, but not with the same facility that he did ten days after the operation.

After my first examination I thought it best to prepare for an operation. So he was sent home, his head was shaved and antiseptics were applied.

The next morning I examined him carefully again. All the conditions remained the same, except a slight increase in their intensity. His headache had been quite severe, necessitating an occasional hypodermic injection of morphine and atropia for its relief. Another careful examination of his head revealed nothing more.

His temperature remained about  $99^{\circ}$ . He had no appetite, was exceedingly irritable and complained constantly of a vague something about his head, which he described as "something wrong with my head." The headache grew worse, and required morphine more regularly for its relief. His bowels and bladder were normal.

There was no material change, except a gradual intensification of all the symptoms, until noon of the fourth day after the injury, when an operation was performed. The scalp had been frequently washed and kept covered with a solution of carbolic acid, 1 to 40, until six hours before the operation, when a solution of sublimate of 1 to 2000 was applied.

Some days previous to the operation I had marked off the chief fissures on the skull. Preparations for the operation were made as in Case I, and the assistance of Drs. Rea and Grady was obtained.

A very large horseshoe-shaped flap was made, the upper border of it beginning just to the left of the median line of the skull. Before finishing the flap I forced my finger between it and the bone, down just beneath the spot of scalp, which had previously shown signs of injury.

I was enabled to feel a slight fracture of the skull. I then continued the incision in flap, not going as far forward as I should have done had I failed to have found the injury of bone, as it was some little distance behind the fissure of Rolando. The scalp wound bled profusely, and the hæmorrhage was only controlled by grasping the full thickness of the scalp with many hæmostatic forceps.

The periosteum was easily raised from the bone, revealing, as marked in Fig. 2, by the inside circle, the location of a very slightly depressed circular fracture, with a border so smooth that it had been impossible to find it before the scalp had been turned back. Blood oozed from the whole surface of the fractured bone. An attempt was made to apply a trephine over the margin of the depression, but the bone was very soft and the blood came up profusely. The trephine was then laid aside, and with an elevator the whole of the external plate was lifted up in one piece, it breaking loose from the whole circumference of the fracture. The hæmorrhage was alarming. The blood rushed out from every direction, pressure having no effect. I at once forced the elevator through the internal table and turned it out as rapidly as possible. The hæmorrhage was so great that I could not see what lay beneath. But, as rapidly as possible, I crushed together the internal and external plate around the whole of the circumference of the opening in the skull with a pair of strong needle forceps. This stopped the hæmorrhage effectually. I then found a tarry, very firm blood clot underneath. It required the steel handle of a knife to displace it. Just underneath the centre of the opening in the skull it measured three-quarters of an inch in thickness, and I estimated it to extend about as shown by the larger marking in Fig. 2. Perhaps the clot was larger.

The amount of clot must have been between two and three ounces, all of which was removed with a knife handle and a stout stream of bichloride solution.

The hæmorrhage had in all probability ceased some time before



the operation was made; but a slight hæmorrhage from a branch of the posterior meningeal, which came up after removal of clot, was effectually stopped by packing with iodoform gauze, which was allowed to remain for twenty-four hours.

I can but think, however, that a greater part of the hæmorrhage was from the sinuses in the bone injured at the point of fracture.

After the clot had been removed the patient showed much more shock than I had expected to see; and had it been an operation requiring further procedure, as in case of tumor, I should have closed



FIG. 2.—Showing location of clot in Case II.

the flap over a thoroughly-disinfected piece of rubber tissue, taken a few stitches, dressed carefully, and waited several days before proceeding further. It is not difficult to conceive of such cases when this procedure would be of great benefit, especially when much hæmorrhage has occurred from scalp wounds, or where much time has been consumed in opening bone and where much shock has followed.

In this case, after packing the cavity lightly at point of hæmorrhage from dura, I placed two layers of iodoform gauze between the skull and flap, taking stitches with long threads in flaps tied in bow

knot, and dressed with iodoform gauze wrung out of 1 to 2000 sublimate solution. This was covered with double cyanide gauze wrung out of same solution, and fixed securely with bandages. Gauze drains had been put in at the lowest border of the incision. It had been necessary to ligate no arteries in the flaps.

When the operation was completed the patient showed considerable shock. He was placed comfortably in bed and artificial warmth applied. In the course of a few hours he reacted fairly well. Sufficient hæmorrhage continued to slightly moisten the dressings.

The next day at twelve the dressings were changed to remove the packing. The long sutures were untied, the flap easily raised except at upper border, where no gauze had been left. Here it was quite firmly united, requiring some little force to separate it. The inner surface of the flap had grown into the meshes of the gauze, requiring force to separate them. This was followed by quite a hæmorrhage, which pressure effectually controlled. The packing was removed; the hæmorrhage had ceased, and the brain quite filled the cranial cavity. The long sutures were tied and cut short, the gauze drain placed in the lower border of the incision, and the dressing made as before.

On the fifth day after the operation, all the stitches and drains were removed; the union was perfect except at the drainage point. The head was redressed as before. The temperature had reached 99° each afternoon, though it was normal each forenoon; the headache remained unchanged, requiring two or three injections of morphine daily to relieve it; appetite was poor, but was improving slightly.

From the second day after the operation the patient occasionally got up and walked about the room; his pulse had increased from a little less than seventy before the operation to between eighty-five to ninety, at which point it remained for some time. This, I attribute more to hæmorrhage which occurred during operation than to anything else. The paresis of hand and arm gradually disappeared from the day after the operation until he was discharged on the eighth day after the operation. At that time he walked with very little limp. He was able to use his hand much better, being able to button his coat or pants, but with a noticeable degree of awkwardness. His condition, otherwise, was as described above. At this time, June, 1893, he shows no indications of the injury.

OPERATIVE PROCEDURES IN ADVANCED AGE,  
BASED ON A STUDY OF SIXTY-FIVE CASES  
AGED SEVENTY OR MORE.

By CHARLES L. GIBSON, M.D.,

OF NEW YORK.

DURING my internship at St. Luke's Hospital, New York city, I saw a rather unusual number of operations on persons of advanced age. The results were a matter of great interest to me, and I have made an investigation of the subject in order to obtain some facts to guide us in these cases. In my statistics I have selected the biblical limit of life, three score and ten, as the minimum figure representing advanced age. Naturally, the number of such cases is small. Such operations as are undertaken are for a large part imperative, being demanded for the immediate prolongation of life, and, therefore, attended with great gravity.

A search through the records of St. Luke's for the last thirty-three years gives sixty-five cases, with a mortality of sixteen, or 24.5 per cent. It must be remembered that statistics covering so long a period must include a number of fatalities of the pre-antiseptic era, which to-day practically never occur.

In the following tables the question of the mortality and its nature will form the chief inquiry. It would be very interesting to study many things, such as the progress of repair, methods and duration of treatment, urinary analysis and far-reaching results; but such statistics, based on so limited a number of cases, of such varying nature, and derived from records covering so long a period, would be worthless. The following table will indicate the general character of the material:

# AGE.

The average age was 73 years, 10 months.

The oldest person was 87.

The average age of the fatal cases was 73 years, 5 months.

The oldest fatal case was 78 years.

# SEX.

There were 49 males and 16 females.

The male sex furnished 75.5 per cent., the female 24.5 per cent. of the total cases.

The male sex furnished 81.25 per. cent., the female 18.75 per cent. of the mortality.

The death rate among the female cases is slightly lower than among the male; this difference is not sufficiently important to draw any conclusions.

# ANÆSTHETICS.

Ether, fifty-seven times.

Cocaine, four times.

No anæsthesia, nine times.

No record, three times (probably none used).

# MORTALITY.

Cause of Death—	Hæmorrhage and shock,	1
“ “	Secondary hæmorrhage,	1
“ “	Shock,	1
“ “	Pyæmia,	2
“ “	Peritonitis,	2
“ “	Pneumonia,	1
“ “	Uræmia,	8

—  
Total, 16

# MORTALITY BY DECADES.

1860-1870. 2 cases with 1 death, 50 per cent.

1870-1880. 12 “ 6 “ 50 “

1880-1890. 27 “ 4 “ 14.8 “

1890- . 24 “ 5 “ 20.8 “

The period 1880-90 furnished the largest number of cases, with the lowest death rate.

Uræmia, therefore, was the cause of 50 per cent. of the total mortality. Death from uræmia occurred not earlier than the eleventh day, and not later than the thirty-second; the average was the fifteenth day, a date of some prognostic importance. It is interesting as well as remarkable that there was only one death from pure shock. This case (No. 2) was almost moribund at the time of operation. The detailed table shows many capital operations, and this absence of shock is most encouraging.

The five cases of death under the headings secondary hæmorrhage, pyæmia and peritonitis, are accidents of the pre-antiseptic period, and would not to-day have to be considered.

There were seventeen cases of operation on the bladder and urethra with eight deaths, of these six were from uræmia.

Perineal cystotomy,	2 cases with 1 death.
Supra-pubic cystotomy,	1 " " 1 "
Supra-pubic lithotomy,	8 " " 3 "
Internal and external urethrotomy,	4 " " 3 "
Lithotrity,	1 " " 0 "
Litholapaxy,	1 " " 0 "

The above class representing 25 per cent. of all the cases gave 43.75 per cent. of the total mortality.

Two strangulated femoral herniæ died respectively from uræmia and shock. One simple femoral and one incarcerated inguinal hernia were cured.

For removal of malignant tumors, nineteen cases with three deaths: 18.75 per cent. of total mortality.

Operations on rectum and anus: four for fistula, three for hæmorrhoids.

A death from peritonitis followed Allingham's operation. From a critical study of the accompanying tables it seems to me that operations on persons of advanced age present a less gloomy outlook than the actual mortality, 24.5 per cent., would indicate.

We have reason to believe that our modern methods will be productive of a much smaller death rate. These methods not only banish death from infection, but also markedly shorten the time

of wound healing. Divided surfaces are now approximated where they were formerly left to granulate. Mischievous and useless drainage tubes no longer leave indolent sinuses which persistently refuse to throw out granulations. Nature is called upon to furnish a minimum of new tissue. The duration of rest in bed is markedly shortened by the favorable progress of wounds, as also by the modern stiff dressings which allow of considerable activity during the convalescence. The latter fact is of cardinal importance and on it depends often the recovery or death of old people. They are generally much depressed by confinement to bed; when they settle into a condition of helplessness and prostration, they must be promptly stimulated by getting them out of bed and changing their immediate surroundings. Some risks in doing so are justifiable, as the other condition is fatal. In the case of an old man of eighty-one, castrated for tubercular epididymitis, there was more or less shock after operation, followed by apathy, weak and irregular pulse and refusal of food. The condition seemed desperate; but on the third day I began getting him out of bed into a steamer chair with a result that was almost magical, and now, two years later, this patient is a surprisingly vigorous, well-preserved, old gentleman.

Infrequent dressings, another advantage of the perfected aseptic methods, are of great value in removing depression from pain and apprehension of pain. Many wounds should require no other dressing than that applied directly on the operating table. On its removal in one to two weeks, all local treatment comes to an end.

Iodoform has been found especially deleterious in advanced age; where there is no actual suppuration it should give way to dressings sterilized by heat alone. I feel certain that the vague complex of symptoms, known as iodoform poisoning, has often been ascribed to uræmia. The two conditions may accompany or mask each other.

What resources have we against uræmia, which the foregoing tables show is responsible for 50 per cent. of the fatal cases? Our resources would appear very limited, for we are dealing generally with long-standing and desperate conditions, especially in the genito-urinary cases. Forewarned, however, is forearmed.



Our investigations, both clinical and chemical, of the condition of the kidneys must be unusually searching. The chemical and the microscopical investigations have been developed with so much minuteness and precision, that we may forget the very valuable hints which close clinical observation may give us. A characteristic pale, pasty countenance, a persistently contracted pupil, marked arterial tension, unexplainable gastric irritability, a very dry skin, are signs which should make us suspicious even in the presence of negative urinary examinations. It has been my experience that occasionally the clinical evidences are confirmed only at a later period by the laboratory examination. Again the laboratory evidence may not be in direct proportion with the severity of the symptoms. Or the examination may be misleading from predominance of certain constituents, mucus, pus or blood.

We must put the patient in the best possible condition before operation. The kidneys are to be relieved of all unnecessary work. The skin must supplement the kidneys' work, and due care taken of its condition. In short, we should resort to all those judicious therapeutical measures that prove of value in such conditions.

The tables show that ether was used exclusively for general anæsthesia. The question arises whether ether, which has an especially bad effect on damaged kidneys, could not have been replaced to some advantage by chloroform? Would such use of chloroform diminish the uræmia mortality without raising the mortality from shock? I cannot answer, my personal experience with chloroform in such cases being *nil*. I cannot help feeling that given a case of badly damaged kidneys chloroform will give us better results. The action of chloroform is certainly tragic. When it acts badly it does so brusquely, scoring a death on the operating table, while ether contents itself with the insidious, but fatal uræmia.

Since writing the above I have seen an article by Blum,<sup>1</sup> giving the results of operations on fourteen cases, seventy and upward. There was but one death, but general anæsthesia was employed only three times. The procedures were for the most part minor operations.

<sup>1</sup> Archives Gen. de Medicine, July, 1892.

DETAILS OF CASES ANALYZED.

CASE	YEAR.	AGE.	SEX.	CONDITION.	OPERATION.	ANÆSTHETIC.	RESULT.
1	1861	74	F	Epithelioma of tongue.	Amputation of tongue.	Ether.	Cured.
2	1868	70	M	Strangulated femoral hernia.	Herniotomy. Artificial anus.	"	Died of shock.
3	1872	73	M	Fistula in ano.	Incision.	"	" " uræmia.
4	1873	72	M	Vesical calculus.	Lithotomy in eight sittings.	None.	Cured.
5	1874	74	F	Hæmorrhoids.	Allingham's operation.	Ether.	Died of peritonitis twenty days later.
6	1874	74	M	Epithelioma of tongue.	Galvano-caustic excision and section of gustatory nerve.	"	Died of secondary hæmorrhage seventy-five hours later.
7	1875	74	M	Rodent ulcer of hand.	Amputation of forearm.	"	Died of pyæmia nineteen days later.
8	1875	75	M	Gangrene of leg.	" " mid-thigh.	"	Died of pyæmia.
9	1876	73	F	Epithelioma of vulva.	Excision.	"	Cured.
10	1877	78	M	Strictures of urethra, and infiltration of urine.	Internal and external urethrotomy.	"	Died of uræmia twelve days later.
11	1878	71	M	Epithelioma of hand.	Amputation of forearm.	"	Cured.
12	1878	74	F	Epithelioma of vulva. II. Abscess of groin.	I. Excision. II. Incision.	"	*Good recovery. Died eight months later of various complications.
13	1879	70	M	Cancer of lip.	Excision and plastic.	"	Cured.
14	1879	76	M	Caries of metatarsus.	Excision metatarso-phalangeal joint.	"	"
15	1880	79	M	Fistula in ano.	Incision.	Not recorded.	"
16	1880	75	M	Strictures of urethra, Chron. diff. nephritis.	Internal and external urethrotomy.	Ether.	Died thirty-two days later of uræmia.
17	1881	72	F	Necrosis of finger.	Amputation of finger.	"	Cured.
18	1882	78	M	Old arthritis of knee with deformity.	" " at knee.	"	"
19	1882	87	F	Epithelioma of face.	Excision and plastic.	"	" (crysip. two days later.)
20	1882	81	M	Double hydrocele.	Both tapped and injected with 5 j. 95 per cent. acid carbol.	"	"

\* Case 12, which died eight months after operation from causes not in relation to the operation, is not included in the mortality statistics.

CASE.	YEAR.	AGE.	SEX.	CONDITION.	OPERATION.	ANÆSTHETIC.	RESULT.
21	1882	73	M	Hæmorrhoids and prolapse of rectum.	Allingham's operation.	Ether.	Cured.
22	1884	75	F	Carcinoma of face.	Excision.	"	"
23	1885	72	M	Ulcers of leg.	Nussbaum's operation.	"	"
24	1885	73	M	Hydrocele.	Tapping and injection tr. iodine.	None.	"
25	1885	71	M	Strictures and fistulæ of urethra.	Internal and external urethrotomy.	Ether.	Died of uræmia sixteen days later.
26	1885	77	F	Biliary calculi and empyema of gall bladder.	I. Incision of abscess. II. Laparotomy.	" (twice).	Died of peritonitis.
27	1885	70	M	Caries of carpus.	Amputation of forearm.	"	Cured.
28	1885	75	M	Sebaceous cysts (three).	Excision.	Cocaine.	"
29	1886	79	F	Recurrent sarcoma of face.	Excision.	Ether.	"
30	1886	70	F	Femoral hernia.	Herniotomy.	"	"
31	1886	70	M	Hydrocele.	Tapping and injection 5 j. ac. carbol, 95 per cent.	No record.	"
32	1887	74	M	Vesical calculi.	Supra-public lithotomy.	Ether.	"
33	1888	81	M	Epithelioma of lip.	I. Extirpation. II. Plastic, fourteen days later.	" (twice).	"
34	1888	70	M	"	Extirpation and plastic.	"	"
35	1888	73	M	Vesical calculus.	Supra-public lithotomy.	"	"
36	1888	70	M	Renal	" cystotomy.	"	Died thirteen days later of uræmia.
37	1888	79	M	Recurrent epithelioma of neck.	Excision.	"	Cured.
38	1889	87	F	Cataract.	"	Cocaine.	"
39	1889	74	M	Suppurative orchitis.	Incision and drainage.	Not recorded.	"
40	1889	74	M	Multiple sebaceous cysts of scalp.	Excision.	Ether.	"
41	1889	74	M	Internal hæmorrhoids.	Whitehead's operation.	"	"
42	1890	73	M	Vesical calculi.	Litholapaxy.	"	"
43	1890	71	M	Abscess of foot.	Incision.	Cocaine.	"
44	1890	75	M	Vesical calculus. Chron. diff. nephritis.	Supra-public lithotomy.	Ether.	Died eleven days later of uræmia.
45	1890	76	F	Cyst of face.	Excision.	"	Cured.

CASE.	YEAR.	AGE.	SEX.	CONDITION.	OPERATION.	ANÆSTHETIC.	RESULT.
46	1890	71	M	Chronic cystitis.	Supra-pubic cystotomy and drainage.	Ether.	Remained in hospital three mos. after operation. Unimproved.
47	1890	74	M	Vesical calculus.	Supra-pubic lithotomy.	"	Cured.
48	1890	70	M	Vesical calculus.	Supra-pubic lithotomy.	"	Died eleven days after operation of uremia.
49	1891	81	M	Epithelioma of tongue.	Amputation of tongue.	"	Cured.
50	1891	72	M	Urethral stricture. Chronic cystitis.	Internal and external urethrotomy.	"	"
51	1891	79	M	Epithelioma of cheek.	Excision and plastic. Secondary hæmorrhage.	"	"
52	1891	70	M	Blind internal fistula.	Incision.	"	"
53	1891	73	M	Vesical calculus. Chron. diff. nephritis.	Supra-pubic lithotomy.	"	"
54	1891	72	M	Chronic cystitis.	Perineal cystotomy.	"	"
55	1891	75	M	Vesical calculus. Chron. diff. nephritis.	Supra-pubic lithotomy.	"	Died twenty-six days after operation of lobar pneumonia.
56	1891	75	M	Incarcerated inguinal hernia.	Herniotomy (closed).	"	Cured.
57	1891	82	M	Vesical calculus.	Supra-pubic lithotomy.	"	"
58	1891	72	M	I. Recurrent carcinoma of mouth. II. Double Dupuytren's contraction.	I. Excision. II. Liberation of bands.	"	"
59	1891	72	F	Strangulated femoral hernia. Chron. diff. nephritis.	Herniotomy.	"	Died eleven days after operation of uremia.
60	1891	72	M	Carcinoma floor of mouth.	Excision.	"	Cured.
61	1892	72	F	Reurrence of carcinoma of breast. Chron. diff. nephritis.	"	"	"
62	1892	76	F	Epithelioma of leg.	"	Cocaine.	Died of hæmorrhage and shock.
63	1892	72	M	Recurrent carcinoma of lip. Chron. diff. nephritis.	Excision with submaxillary glands. Uncontrollable hæmorrhage.	Ether.	"
64	1892	70	F	Lipoma of neck.	Excision.	"	Cured.
65	1892	73	M	Fistula in ano.	Incision and curetting.	"	"

## TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

*Stated Meeting, May 1, 1893.*

The President, DR. WILLIAM HUNT, in the Chair.

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### THE TREATMENT OF VESICAL CALCULUS.

Dr. JOHN ASHHURST, JR., reported his individual experience, which embraced fifty-one cases. One case was that of a female child, on whom he performed lithectasy, or rapid dilatation of the urethra, but the remaining fifty were in male subjects. In thirty-five of these fifty cases the patients were operated on by lateral lithotomy. Of the thirty-five cases operated on by the lateral method, twenty were in children under the age of puberty, and in every case the patient recovered. In males beyond the age of puberty, including a fair proportion of quite old persons, there were fifteen cases with three deaths, but only one of these three was really the result of the operation. In this case secondary hæmorrhage occurred on the ninth or tenth day, and the attempts made by the attending physician to control it were not successful.

There were six cases of the median operation, with one death. In one case the operation was done for the removal of a foreign body, the end of a catheter. In this case the operator succeeded not only in removing the foreign body, on which there was a small calcareous deposit, but also in relieving the chronic retention of urine, from which the patient had long suffered, by tearing off the median lobe of the prostate with the forceps. This was fully ten years ago; the patient is still living, and has not had occasion to use a catheter since. The case which proved fatal was in a patient in the last stages of cystitis and chronic renal disease, and in which the presence of the stone was simply a complication.

There was one case of the supra-pubic operation, in which the

stone was a small one, this particular operation being chosen because the case was really one of villous tumor of the bladder, and the presence of the stone was simply a complication. The patient was in a critical condition from hæmorrhage at the time of the operation, but made a good recovery.

Litholapaxy was performed eight times, with six satisfactory recoveries and two deaths. Both the deaths were from uræmia, dependent upon chronic disease of the kidney.

The largest calculus removed weighed three ounces and some drachms. It was removed by the ordinary lateral operation. It was not necessary to enlarge the wound by dividing the right side of the prostate, nor was it necessary to crush the stone. By making a large external wound, by grasping the stone with sufficiently powerful forceps, and by patience in manipulation, this stone was removed without difficulty, and the patient made an excellent convalescence.

The largest number of stones removed from one patient was fifty-four. These were removed by lateral lithotomy. The patient made a good recovery, but returned in a year or so with recurrence of the symptoms from a descent of more stones from the kidney. Litholapaxy was then done. The patient did pretty well for a few days, but then the urine became turbid, containing a large quantity of ropy mucus and pus, uræmia developed, and the patient died in convulsions.

The reporter considers the operation of litholapaxy in children to be a more severe one than lithotomy. The results of cutting for stone in children are so satisfactory that nothing better can be desired. The great advantage of litholapaxy is the short time required for after treatment. If all goes well, litholapaxy will allow the patient to go about his business in five or six days. This is a great advantage in adults who are engaged in active business; but in young children it is a matter of no importance.

The median operation he thinks to have a very limited field. Cases of foreign body in the bladder and cases of very small stone are those to which this operation is adapted.

The supra-pubic operation he would reserve for very large stones, or for cases in which there was some complication, such as tumor, in addition to the stone.

In the female, the operation of lithectomy, or rapid dilatation, is the one to be chosen, and in almost all cases will be sufficient. The high operation may, of course, be required for very large stones.



As regards the operation of lateral lithotomy, the points which are to be observed are, in the first place, to make a large external wound. In the second place, it is of great importance to strike the staff as far back as possible. Having struck the staff, the deep incision should be made small.

#### A TRACHEOTOMY TUBE WORN FOR SIXTY DAYS.

Dr. H. R. WHARTON reported the case of a child, eighteen months of age, whom he had intubated for the relief of diphtheritic croup, but at the end of fifteen hours the tube was coughed up. Tracheotomy was then done and the patient subsequently did well.

On the tenth day after the operation the tracheotomy tube was removed and the patient breathed comfortably, but in fifteen or twenty minutes after the removal of the tube the dyspnoea rapidly recurred and became so urgent that the tube had to be replaced.

Attempts were again made to remove the tube at intervals of a day or two for a week or more with a similar result. Four weeks after the operation the child was etherized and the tracheotomy wound was dilated, so as to expose the wound in the trachea. It was then found that there were a number of masses of granulation tissue springing from the trachea in the region of the tracheal incision; these were removed with forceps and scissors, and the tracheotomy tube was again introduced. After waiting a few days another attempt was made to remove the tracheotomy tube, but this also failed. An intubation tube was introduced upon the removal of the tracheotomy tube, and was worn for some hours, and upon its removal the child was able to breathe comfortably for five hours; but after this time dyspnoea recurred, and the tracheotomy tube was again introduced. After several trials of the intubation tube, it was finally abandoned, and it was decided again to etherize the patient and examine the tracheal wound, fearing the granulations had recurred. The patient was etherized and the tracheotomy wound was enlarged so as to expose the tracheal wound, and it was found that again a number of masses of granulation tissue were present; these were removed with forceps and scissors, and their bases were touched with the solid stick of nitrate of silver. An intubation tube was then introduced, and it was worn for twelve hours, when it was coughed up. After forty-eight hours the intubation tube was replaced. The intubation tube was worn for four days and was then removed. The child after this time had no further difficulty with his breathing. The patient wore the tracheotomy tube for a period of sixty days.

Dr. WHARTON also reported a case of intubation of the larynx, in which the tube was worn for fifteen days. The patient was a child less than two years of age, who was suffering from marked dyspnœa, which had come on gradually in the previous forty-eight hours. Immediate and complete relief was afforded by intubation, but, though systematic attempts to dispense with the tube were made every second day, recurrence of the dyspnœa required its reintroduction, and it was only on the fifteenth day that the tube was permanently removed.

In most acute cases the patient is usually able to dispense with the intubation tube in from five to eight days; this case wore the tube for fifteen days, the longest period in his experience that an intubation tube has been required.

Dr. WHARTON also showed two cases of excision of the hip-joint for coxalgia. One patient, a boy seven years of age, ten months after the excision of the hip-joint, has a very firmly healed wound and a very good range of motion at the false joint; his general condition is also excellent. The second patient, a boy eight years of age, nearly two years after the operation, has a remarkably free range of motion at the false joint, and his general condition is excellent.

Dr. WHARTON also showed a specimen of fracture of the right femur, showing the condition of the bone eighteen days after the injury, from an infant eight months old. Emily S., eight months old, was admitted to the Children's Hospital, June 18, 1892, having sustained an injury of the right femur from a fall ten days before admission. Examination showed that there was a fracture of the shaft of the right femur. The child was suffering from enterocolitis at the time of admission, and was quite sick; the fracture was dressed with a moulded binder's board splint. The patient grew gradually worse, and six days after admission developed a temperature of  $107^{\circ}$  and died. Examination of the specimen shows marked overlapping of the fragments at the seat of fracture, the shortening being at least one inch.

This specimen is of interest, as it shows that, contrary to the generally accepted teaching that there is little shortening in fractures of the femur in infants, marked overlapping of the fragments may occur, giving rise to very considerable shortening.

A CASE OF DETACHMENT OF THE LIGAMENT OF THE  
PATELLA, TREATMENT BY SUTURE.

Dr. W. B. HOPKINS reported the case of a large, healthy man, forty-five years of age, who had stumbled and fallen, striking his right knee with great violence upon a cobble-stone. There was a moderate fluctuation from effusion. The entire patella could be felt and seen drawn well up the thigh. No fragment of bone could be detected above the tuberosity of the tibia. A longitudinal incision in front of the joint revealed that in addition to the detachment of the ligament from the patella, the whole fibrous covering of the latter had been stripped off and remained attached to the ligament. The patella was readily brought down to its natural position between the condyles, and but for its bare anterior surface was found to be intact. Coaptation was effected by silkworm-gut sutures, and the wound was closed. The after course of the healing was without disturbance. In a month the patient was allowed to get into a wheeled chair. The natural contour of the joint was entirely restored.

Five months after the accident he was allowed to begin to flex the knee with considerable force. Almost all the motion he now has, has been acquired within one month. He walks without a limp, and his limb has almost completely regained its strength. The patella is felt to be freely movable, and there appears to be no obstacle to the restoration in a short time to the normal function of the joint.

## EDITORIAL ARTICLES.

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### PORTER ON THE INDICATIONS TO BE DRAWN FROM THE URINE AS TO THE SAFETY OF ANÆSTHETICS.<sup>1</sup>

AT a meeting of the Clinical Society of the New York Post-Graduate Medical School, Dr. William H. Porter presented a paper upon this subject which contains some original and well-supported views as to the action of anæsthetics, and the indications as to their safety presented by the state of the urinary excretion.

After describing the characteristics of normal urine and the transmutation changes which regularly occur in it when exposed to the air, which are indicative of a normal state of the system, and one in which the nutritive vitality is well maintained, he states that patients presenting such a normal urinary excretion bear etherization and chloroformation without ill effects as a general rule. When, however, the quantity of urine being normal, or below the standard amount, the color is pale and the density low, it indicates that digestion and absorption are imperfectly effected, and that nutrition is below the normal standard, and vital activity deteriorated. Patients in such instances, while they do not necessarily succumb to the damaging effects of anæsthetics, may not bear the etherization or chloroformation well, and often require stimulation before the administration and during the anæsthetic period. Chloroform in these cases is equally as safe as ether.

If the urine is scanty, high-colored and of high density, it is usually associated with a deficiency of urea and an excess of uric acid, and often contains a number of other by-products, all of which

<sup>1</sup> The Post-Graduate, July, 1893.

are due to the incomplete oxidation of the proteid molecule. The urine may be normal in amount, of normal or higher color, yet the density be abnormally high, but with a diminished amount of urea.

The urine may also be abundant in quantity, light in color, deficient in urea, and still of high density. This is usually due to the presence of glucose with its molecular weight of 180. All these conditions are clearly explained by a study of the true chemical composition of the urine and the molecular structure of the urea, uric acid and the other by-products of proteid tissue waste.

When the normal or highest oxidation of the proteid molecule is maintained the most perfect end-product is urea, a nitrogenous body of great solubility and low molecular weight. Therefore normal urine has the density already described, and readily undergoes the transmutation changes which speedily result in the formation of the ammonio-magnesium phosphate crystals in abundance.

He believes that the scanty flow of urine, of high color and density, and a deficient production of urea, is due to incomplete oxidation of the proteid molecule with the formation of uric acid, lactates, oxalates, etc., all of which have a higher molecular weight than urea. For instance, the molecular weight of urea is 60, that of uric acid is 168, and its urates 190. In other words, each molecule of uric acid is 2.6 times heavier than urea; and the urates, 3.16 times heavier. This, however, is not so bad as are some of the other conditions, as the uric acid molecule carries out of the system twice as much nitrogen as urea. But when the uric acid is present in abundance at the expense of the urea, it indicates incomplete oxidation and impaired nutrition, with some granular change in the liver, kidneys and glandular organs. Such cases bear anæsthetics poorly and often succumb a few days later.

If to the urine containing uric acid there is added the oxalates which have a molecular weight of 129, and the lactates with their molecular weight of 112, the density of the urine will be still higher. These by-products indicate a still lower state of oxidation and a greater loss of inherent vitality. When this is the case the probabilities regarding anæsthesia are still more uncertain.

He calls attention to still another variety of scanty urine of high density which is indicative of the lowest grade of nutritive vitality, and in which all the glandular organs are very much impaired, and yet albumen casts and glucose may not appear in the urine. It is that variety in which the nitrogenous waste that should pass out of the body through the biliary secretion as bile salts and coloring matters pass out through the renal organs. When this is the case the urine, unless very abundant in quantity, is very dark in color, the density from 1030 to 1040; and it may rise as high as 1060. The high density in these cases is explained by the great molecular weight of the bile salts and coloring matter as compared with urea. The glycocholate of soda, for instance, carrying only one atom of nitrogen, or one less than urea, has a molecular weight of 487, and, therefore, is 8.11 times heavier than urea. The taurocholate of soda, also containing only one nitrogen atom to the two in urea, has a molecular weight of 537, and is, therefore, 8.95 times heavier than urea.

The bile coloring matters also have a high molecular weight. That of bilirubin being 286 and the biliverdin 322, the former is, therefore, 4.76 while the latter is 5.39 times heavier than urea. Urine of this composition indicates a very great disturbance in the assimilative powers of the system, and indicates a general retrograde change in all the glandular organs and tissues of the body.

It is the opinion of the author that etherization and chloroform-ation followed by operative interference in cases of this kind are very apt to terminate fatally. Absence of albuminous casts and glucose have led to the supposition that the patient was in a good condition for etherization. He has made the necropsy in a number of fatal cases of this nature, in which the action of the ether was just sufficient to cause a rapid dissolution of the glandular organs, toxic symptoms and speedy death.

A study of this class of cases has led him to believe that when the urine contains an abundance of these by-products of proteid oxidation with a high specific gravity and no albumen casts or glucose,



the patient is still in a very precarious condition, and often more likely to succumb under the anæsthetic than when that state of sub-oxidation exists which produces albumen and glucose. Of course, when casts are present it indicates a more marked retrograde change in the kidneys, and chloroform, he thinks, is to be preferred to ether. According to Dr. Porter, these unobserved glandular changes cause most of the fatal results in surgery. Were it not for these weak points in the system, almost every operative case ought to recover, inasmuch as the mechanical part of surgery has been brought by antiseptics almost to absolute perfection.

The author then goes on as follows, to show how the anæsthetic is a factor in producing these bad results, and gives a very clear statement of the physiology of ether and chloroform anæsthesia.

Ether is an hydro-carbon, *hydroxyl* derivative, being composed of carbon, hydrogen and oxygen ( $C_4 H_{10} O$ ); while chloroform is an hydro-carbon, *chlorine* derivative, being composed of carbon, hydrogen and chlorine ( $C H Cl_3$ ).

In using either ether or chloroform, anæsthesia cannot be produced so long as the requisite amount of oxygen is supplied to the system.

The activity of the medullary centres is dependent upon the active supply of fully oxygenated blood. Therefore it is but just to assume that the chief factor in producing the anæsthetic state, both with the ether and the chloroform, is the direct result of the displacement or shutting out of the oxygen supply from the respiratory passages, and thus from the blood, by the anæsthetic used. This is unquestionably true with the nitrous oxide ( $N_2 O$ ), also with ether and chloroform.

This taking away from the system of the great heat-producing element, which is indisputably the prime agent in stimulating the whole animal chemistry into action and maintaining its normal activity, is the chief function of the anæsthetic. At the same time there is rapidly induced an imperfectly oxygenated state of the blood, so that the natural stimulation of oxygenated blood upon the

cardiac, respiratory and vasomotor centres is reduced to a minimum point compatible with a continuance of the cardiac and respiratory actions.

When the natural peripheral irritation of the centripetal nerves by the heat produced through the oxidation of the food products is suspended or totally abolished, and the oxygen in the blood has been reduced until only the cardiac and respiratory centres are capable of being irritated sufficiently to keep only the heart and respiration in motion by this low percentage of oxygen in the blood, the patient is thrown into a quiescent and dead state, commonly called anæsthesia.

From this condition the patient cannot be aroused except by restoring the oxygen supply, re-establishing the peripheral heat production, and raising the percentage of oxygen in the blood to the normal standard until it will normally excite the central cells into greater activity. In some instances, when the anæsthesia is prolonged or pushed too strongly, the sub-oxidation of the body is carried to such a profound degree that oxidation cannot be re-established by natural means. When this is the case, extraneous heat has to be applied to excite the reflex activity of the nervous mechanism until oxidation and natural heat-production can be re-established to keep up the nerve action.

The author, following this line of argument a step further, says that only one conclusion can be drawn, namely, that the administration of ether, for the purpose of producing anæsthesia, immediately develops within the system a state of general sub-oxidation directly in proportion to the amount of oxygen that is shut out of the air passages.

This absence of oxygen in the blood induces general mal-nutrition by arresting oxidation of the proteid fat and glucose molecules of the food-stuffs. As a secondary result, the products of tissue-waste are at first decreased, then incompletely formed and, in many instances, are irritating or poisonous in character. After the anæsthesia they are abundant and incompletely formed.

He claims from these facts that it becomes apparent at once that

the system is chemically damaged by ether anæsthesia, mal-nutrition induced, extra strain imposed upon the physiological mechanism, and all the glandular organs called upon to perform extra work upon a defective nutritive supply. When this stage is reached all the functions are abolished except the cardiac and respiratory. In a perfectly normal individual this extra strain can be borne almost with impunity for hours.

When the physiological economy is below par, the reverse often holds true, and alarming and fatal consequences are witnessed. In this latter case there is often developed immediately, or within a few hours after the anæsthesia, symptoms which are called "septic," and are followed by death.

Since the introduction of antiseptics, and by careful post-mortem observation, it has been found that these so-called septic symptoms are developed without any septic infection through or from the wound.

He believes that they are the results of the damaging effects upon the system resulting from the sub-oxidation induced by the anæsthetic which has shut out the oxygen and arrested glandular action. This results in rapid retrograde changes in the epithelial cells of the glands, with a retention of the excretory products within the system, which should now, more than ever, be eliminated.

Thus ether causes the death of a large number of cases, but in a day or two after the anæsthesia, rather than upon the operating table.

In those cases in which there exist in the urine these positive evidences of retrograde changes in the glandular organs of the body and a state of universal sub-oxidation, there is reason to suspect unpleasant symptoms, or even death during anæsthesia. But in most instances death is delayed until a few hours or a day or two after the operation; and the fatal results are brought about by the excretory organs in their previously damaged condition being unable to cope with a further state of sub-oxidation, and the augmented demand upon their fundamental activity. At this stage albumen and casts usually appear when not present before.

He very aptly observes that this delay in the fatal result takes the odium off the ether as compared with chloroform, while the ether still remains equally responsible, and probably causes as many if not more deaths than chloroform.

Owing to the great volatility of ether, the heat of the body rapidly drives it from the air passages, so that it requires a considerable volume and some time to displace the air from the lungs and cause the sub-oxidation, arrest of functions, and, finally, the condition called anæsthesia.

He gives still another reason why ether is slow in producing anæsthesia, namely, that it is a readily inflammable compound, and to a certain extent is oxidized in the epithelial structures of the respiratory passages, with the production of carbon di-oxide and water, and a definite yield of heat for each gramme oxidized. Each gramme of ether consumed in this way requires for its complete oxidation 2.59 grammes of oxygen, or about the same as is required in the consumption of fat and alcohol.

This rapid oxidation of the ether also aids in shutting out the oxygen from the blood. But at the same time it generates considerable heat in the lungs, which irritates the peripheral ends of the centripetal nerves of the respiratory system. This explains why the respiration and circulation are well sustained during the primary stage of ether anæsthesia, and shows why the heart and lungs are not apt to fail early, as occasionally occurs with chloroform.

It also illustrates the apparent failure of the respiratory act as the anæsthesia deepens. The reflex action of the respiratory nerves is exhausted by this rapid and continuous production of heat, and at this stage the reflex respiratory irritation ceases to be a factor in keeping in motion the medullary centres. The respiratory centre has not yet accustomed itself to the method of irritation through the blood only. Now the deep pressure in the epigastric region, or the quick and forcible compression of the chest is just enough to keep the medullary centres active until they accustom themselves to the poorly oxygenated blood supply to keep up their motion.

By the aid of these physiological phenomena, it is clear that the heart and circulation must fail first in the poisoning effects of ether anæsthesia. The medullary centres are primarily kept in motion by oxygenated blood and are only secondarily influenced by reflex impulses; therefore, so long as blood containing the requisite amount of oxygen continues to reach the medulla its functional activity must continue.

The ether, mechanically, and by its oxidation in the air passages, deprives the blood of its requisite supply of oxygen, therefore, failure of the circulation in the medulla is the first chain in the depressing influences of ether anæsthesia.

Owing to the lack of the peripheral reflex stimulation and the previously overworked condition of the centripetal pulmonary nerves, as explained by the exhalation of the ether in the lungs, the respiratory centre is apt to be somewhat depressed as compared with the cardiac, so that when the two are compelled to depend exclusively upon the irritation of the imperfectly oxygenated blood flowing through the medulla for their activity, the respiratory centre usually fails to respond, while the cardiac centre continues to innervate the heart. If for any reason there is a previous exhaustion of the cardiac centre, it shows evidence of primary failure. Thus elucidating the contradictory evidence of the Hyderabad Commission.

He then takes up the subject of chloroform, which acts upon the same principle as nitrous oxide and ether by shutting out the air from the respiratory passages, and the oxygen from the blood.

Chloroform is a heavy liquid having a molecular weight of 119.4 to that of 74 for ether. It is easily and rapidly drawn into the air passages, and not being very volatile is not readily displaced, so that very much less chloroform is required to displace the air and shut the oxygen out of the blood than holds true when using ether.

The persistent retention of chloroform in the cavity of the respiratory chambers explains why a very little can be given at a time, and shows how a little crowding of the chloroform easily asphyxiates the patient and causes failure both of the heart and lungs. As the

chloroform cannot be oxidized and made to yield heat like the ether, the failure of the heat and respiration comes suddenly. Before there is time to excite the respiratory and cardiac centres by extraneously applied heat, and re-establish the natural heat products by normal body oxidation, the centres have ceased to act forever.

He is of the opinion that intelligently and carefully administered this accident cannot occur, and the use of chloroform is just as safe as that of ether.

With chloroform this deprivation of the system of its oxygen can be accomplished without any expenditure of oxygen as occurs with ether, and consequently no extra heat is produced which irritates the system and aids in intensifying the sub-oxidation; in other words, properly handled, chloroform produces complete sub-oxidation quickly and with the least possible shutting out of the oxygen from the blood. Therefore, scientifically used in perfectly normal individuals, chloroform is less damaging to the animal economy, and much safer than ether. And, in fact, he claims that in perfectly normal individuals, if properly administered, ether and chloroform, while damaging the true physiological economy in producing anaesthesia, can yet be given with absolute safety.

Anæsthetics, however, are rarely administered to normal individuals; they are always more or less unsound, otherwise there would be no occasion to use these agents. Therefore an entirely different problem confronts us, and necessitates a thorough understanding of the physiological economy, and how to find it out through the urine.

After this thorough discussion of the action of the anæsthetics, Dr. Porter goes on to explain their bad effects as follows:

Ether, if given too quickly and too freely, may cut off the oxygen so completely as to cause instant death; this rarely happens. In other more or less pathological subjects, the rapid oxidation of the ether in the lungs wears out the irritability of the centripetal respiratory nerves in the lungs. The blood-vessels rapidly expand, which, together with a large production of water from the oxidation of the ether, induces a fatal cedema of the lungs.



Usually in the early stages of anæsthesia, the pulmonary blood-vessels contract, but as the anæsthesia deepens they relax and with the water generated from the oxidation of the ether there is always a free flow of bronchial mucus, but not to a sufficient degree to produce any alarming symptoms.

Occasionally a rapid oxidation of a large quantity of the ether exhausts the oxygen supply, and, by over stimulating the centripetal nerves, and through these the central ganglion cells, causes a rapid exhaustion of the nervous system, followed by a sudden respiratory and cardiac failure and death.

Thus we have an explanation for the possible development of sudden death by ether anæsthesia.

He is, however, inclined to believe that more frequently death due to ether anæsthesia comes on after the administration, and is caused by the secondary glandular degeneration and consequent toxæmia induced therefrom.

Though chloroform has been found to be perfectly safe as a rule where properly administered, still there are a few cases that succumb suddenly when attempting to take chloroform and apparently without any satisfactory reason. Dr. Porter assumes that this never occurs in perfect states of health, but only in those that are more or less pathological.

He advances the hypothesis that these sudden deaths are due to an oxidation of the proteid molecule in the epithelial cells of the respiratory passages, which results in the formation of free ammonia ( $\text{N H}_3$ ). This unsatisfied radical in the presence of the heat of the respiratory chambers and the free oxygen, results in the decomposition of the chloroform in one of three methods; all of which give rise to the formation of suffocating and poisonous gases; which fill the deeper air passages and suddenly and completely shut out the oxygen from the blood. Thus arresting life at once.

These chemical changes he gives as follows:  $\text{C H Cl}_3$  plus  $\text{N H}_3$  plus  $\text{O} = \text{C O Cl}_2$  plus  $\text{N H}_4$  plus  $\text{Cl}$ , or  $\text{C H Cl}_3$  plus  $\text{N H}_3$  plus  $\text{O} = \text{C O Cl}_2$  plus  $\text{N H}_4 \text{ Cl}$ , or  $2(\text{C H Cl}_3)$  plus  $2(\text{N H}_3)$  plus  $2(\text{O}) = \text{C Cl}_4$  plus  $2(\text{N H}_4 \text{ Cl})$  plus  $\text{C O}_2$ .

The following practical deductions are drawn from this chemico-physiological analysis of chemical phenomena :

(1) That ether and chloroform act upon the same principles, but with results developed by slightly different methods.

(2) That both are capable of producing death at the time of the anæsthesia ; chloroform more frequently than ether.

(3) That ether causes as many, if not more, deaths than chloroform, but the fatal issue is delayed until the patient has been removed from the operating table.

(4) That by a careful study of the density of the urine and its causes, we are in possession of exact information by which we can determine the precise nutritive condition of the system, and be forewarned as to the possible outcome of the anæsthesia. It also enables us to judge which anæsthetic is best adapted to the individual case in question.

(5) We are taught that neither ether nor chloroform should be administered until the glandular organs, in their necessarily damaged states, are put in the best possible condition to endure this extra strain. When this is a general rule many cases that now prove fatal will be saved.

(6) It teaches that every public institution should have a paid physician who is competent to examine the urine, and determine through it the status of the physiological economy before giving the anæsthetic. It should also be the duty of this same physician to administer the anæsthetic, for he alone knows best which anæsthetic to select with a given condition of the system, and is also better able to guide the patient safely through the anæsthesia than one who knows nothing of the constitution of the patient except from a second party.

(7) While it is clear that death in some instances is directly due to the primary effects of the ether and chloroform, and in others to secondary effects, it should not deter us from using them, but stimulate us to be more thorough masters of their actions upon the system, and thus to guard against their ill effects. When all this is accomplished, chloroform will probably hold the first place as an anæsthetic.

### KRAUSE ON THE TRANSPLANTATION OF LARGE SKIN FLAPS WITHOUT A PEDICLE.<sup>1</sup>

KRAUSE introduced this subject, at the last meeting of the German Surgical Congress, by saying that in extensive skin defects on the limbs it has been the custom until now, in order to avoid amputation, to transplant skin flaps attached by a pedicle to some other part of the body. Unfortunately, Thiersch grafting is not always applicable to these cases, and the operations with pedicle flaps are often very uncomfortable for the patient. The limb has to be fixed with plaster bandages to the part from which the flap is taken, and the patient kept in this often uncomfortable position until the flap has become adherent, which takes ten to fourteen days.

On this ground Krause has for the past two years repaired large skin defects by flaps without a pedicle. He does not involve the subcutaneous connective tissue in the flap, but takes only the cutis and cuticle. He has reported excellent results in the treatment of large chronic ulcers of the leg which had tended repeatedly to break out anew, also in plastic operations on the face, especially after extensive operations for lupus or epithelioma. By observing certain rules, the transplanted flap can be made to adhere with the greatest certainty. The author's experience involves twenty-one cases, in which more than one hundred flaps were used; and of this number only four suffered complete necrosis. The size of the flap seems to have no importance. Spindle-shaped flaps, twenty to twenty-five centimetres long, and six to eight centimetres wide, heal just as well as the smaller ones.

The chief thing is that the operation be done aseptically, and that the bleeding on the surface to be covered be completely checked by compression.

The surface upon which the transplantation is to be done must either be a fresh wound, such as remains after the extirpation of a lupus area or epithelioma, or it must be converted into one. In the

<sup>1</sup> Verhandlungen der deutschen Gesellschaft für Chirurgie, XXII Kongress, 1893

latter case, after the wound or ulcer has been cleaned, the limb should be rendered artificially anæmic, and the whole region about the field of operation disinfected, and the granulations vigorously scraped away with a sharp spoon. The whole field should then be washed with sublimate solution, and this washed away with salt solution. After this the wound is thoroughly dried with sterilized gauze. The instruments and hands must also be dry. In every case of granulating wound the ground of the defect should be removed with the knife. The dense fibrous tissue which underlies an old ulcer or granulating surface of long standing should be excised down to fairly normal tissue. It is of no consequence if an excavation results, for, as is known from experience with Thiersch grafting, these hollows soon become lifted up to a level with the surrounding skin. The same procedure is followed in chronic ulcers of the leg. If the underlying tibia is thickened, it can be chiselled off level. As a dressing, Krause uses sterile gauze, firmly bandaged over the wound. After the dressing has been applied the tourniquet is removed from the limb.

The surface from which the skin is to be taken should be disinfected. This must not be done too vigorously. Krause advises against strong scrubbing with brushes. The sublimate solution should be washed away with salt solution, and the skin thoroughly dried with sterile gauze. The skin should be cut away with the greatest aseptic precautions, and only dry hands and dry instruments employed. The skin of the inner and front sides of the arms and the front of the thighs, and also from the rump, can be used. In order that the defect can be closed immediately by suture, it is well to remove an oval or spindle-shaped piece.

In order to quickly separate the skin from the subcutaneous fat, the whole flap should be cut about with the knife, and then the lower angle of this spindle-form area lifted up with toothed forceps, and with the knife held almost at a right angle to the under skin surface, the flap is cut away. When a sufficiently large piece has been cut, in order to avoid any unnecessary manipulating of the wound surface

of the flap, it should be folded wound surface against wound surface, and thus held between the fingers. Such detail as this insures a better result.

When necessary a patch can be taken from the whole length of the fore-arm or upper-arm, and still of such a width that the defect can be closed by suture. To facilitate this the subcutaneous fat may be, if necessary, cut away after the flap has been removed. In this manner it is possible to remove large pieces of skin in a very few minutes. The delicate connective tissue layer between the skin and the subcutaneous fat comes away with the flap. When here and there a little fat remains attached to the skin it does no harm.

The skin patch, which contracts to two-thirds, or less, of its original size, should be placed immediately upon the wound surface, all bleeding from which has in the meantime been checked by compression, or the occasional twisting of a vessel. Ligatures should never be applied, as they act as foreign bodies, and prevent the flap from coming in contact with the surface from which it must receive its nourishment by diffusion. By applying pressure to the flap for a short time it becomes cemented to the floor by a thin layer of coagulum, which holds it when the pressure is removed.

It is never necessary, in the limbs, Krause thinks, to suture the flap to the surrounding tissue. He has used the suture only in one operation, on the upper lip. When possible the whole defect should be covered with the transplanted patch. The dressing should be applied so that first a 5 per cent. sterilized iodoform gauze bandage be bound about the wound, in order to hold the flap firmly in place. Over this should be placed a moderately firm dressing, and the limb immobilized by a splint.

The first change of dressing should be done, according to Krause, on the third or fourth day, because vesicles often form and should be opened. In order to prevent the slightest disturbing of the graft, at first only the outer dressings should be removed. The whole limb should then be immersed in boracic solution for an hour or more, until the dressings are soaked loose. On reapplying the dressings

a piece of iodoform gauze thickly covered with boro-vaseline should be placed over the graft. This same care should be employed at all subsequent dressings.

After four days the flap appears pale, or, as the result of infiltration with blood pigment, purple and livid. A certain amount of swelling is also present. At the end of seven or eight days it takes on a reddish tint, which at the end of two weeks becomes much more pronounced, especially when the dirty, grey epidermis, which always comes away, is picked off. Here and there may sometimes be observed small, superficial areas of necrosis, or the whole thickness of the flap may be involved. But in the larger part the flap heals firmly. When a superficial necrosis does take place the deeper glandular structures of the skin remain alive, and new skin is quickly formed. Krause has observed that these skin grafts do equally well when planted on muscle, fascia, connective tissue, periosteum, dura-mater, or directly on a denuded, cortical, or cancellous bone surface.

The time required for complete healing depends on the condition of the grafted surface, and the thereon dependent nourishment of the flap; it also varies with the age of the patient; and may be set down as from three to six weeks—seldom longer. Sensibility becomes established only after a long time.

Inasmuch as skin from any part can be transplanted by this method, defects in hairy surfaces can be corrected by the transplantation of hair-producing skin.

After the wound has healed the new skin becomes movable, and microscopic observation, after twenty-two days, has demonstrated a thin layer of newly-formed subcutaneous fat.

JAMES P. WARBASSE.



## INDEX OF SURGICAL PROGRESS.

### GENERAL SURGERY.

**I. Green Pus and the Pathological Importance of the Bacillus Pyocyaneus.** By C. SCHIMMELBUSCH, M.D. (Berlin). The bacillus pyocyaneus produces not only blue pus, but also green and brown pus, and any possible shade between these two colors. These colors are independent of the quantity of air, the nutrient soil, and of the bacillus itself. Its form may change in various soils and under certain circumstances, so that it is not always easy to recognize it. Green suppuration has not become less frequent in spite of antiseptis and asepsis. In spite of all caution it has been seen in wounds healing by first intention. In Bergmann's clinic, out of ten cases of removal of the mammary gland, which ran an entirely reactionless course, this bacillus was discovered in seven. According to Muehsam's investigations this is due to the fact that this bacillus is a frequent parasite upon the body, inhabiting the armpits, the anal fissure, the inguinal folds, etc. That it is very frequently found on the human body is evidenced by the greenish discoloration of hydrophathic compresses and the linen of those that perspire profusely. Symmes has proved by careful researches in Bergmann's clinic that it does not exist in the air. Although it does not present the characteristics of an invasive pathogenic microorganism, yet it is not a harmless saphrophyte, for, besides its disgusting odor, it greatly increases the discharge, thus affecting the entire organism, prevents healing by disturbing the growth of granulations, and by getting deep down between the granulations it impedes the formation of new integument. Patients with green suppuration are also liable to an insidious and slow intoxication.—*Sammlung klinischer Vorträge*, N. F., No. 62, 1892.

FRANK H. PRITCHARD (Norwalk, Ohio).

**II. Wound Diphtheria.** By C. BRUNNER (Zürich). By the term wound diphtheria, Brunner understands every sort of wound infection which has for its cause the specific Klebs-Loeffler diphtheria bacillus. Every surgeon who is frequently called upon to perform tracheotomy for diphtheritic stenosis, he says, has had opportunity to observe diphtheria of the operation wound, the infection of which has come from the primary infection within the larynx. Besides this infection, extending from a near-by previously existing source, he speaks also of contact infection, in which the bacilli are deposited in the wound from some remote source on the same person or from another individual. Strange to say, he has been able to find nothing in literature concerning bacteriologic investigation of diphtheritic wounds. Such investigation suffices to demonstrate the identity of the bacillus of wound diphtheria. This author has identified the bacillus in three cases of wound infection, in which the wounds were not in connection with the seat of primary infection. One of these cases was a punctured wound of the thumb; the second, a wound of the middle finger, and the third, a phlegmon of the scrotum. In all of these cases was a mixed infection with pyogenic cocci. The wounds presented the same morphological and biological changes as occur in diphtheria of the throat. The degree of virulence differed in all three cases. In one case the bacilli were highly pathogenic, inoculated guinea-pigs dying in a very short time. In the other two cases the virulence was weaker, though the bacilli placed on the excoriated mucous membrane of the beaks of pigeons caused the formation of false membrane. Birds thus inoculated died after a few days.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

**III. The Disinfection of Septic Wounds.** By Dr. SCHIMMELBUSCH (Berlin). Schimmelbusch remarks that although numerous experiments have been made which have established the parasitidal property of a great number of so-called antiseptics, the evidence is still wanting that these substances have the power of

destroying the sources of infection in infected wounds. The experiments with disinfectants have always been made on dead infected objects, but not on wounds. Such experiments on wounds, he says, should be carried out simply to observe whether it is possible to disinfect the wounds themselves. This can be easily done; at least, in septic wounds. It simply requires that an animal be wounded, the septic material placed in the wound, then the rinsing with the antiseptic substance, and observing whether the animal remains alive and healthy or not.

Schimmelbusch has experimented in this way with rabbits and mice. With the first he used a very virulent species of streptococcus, and with the mice he employed the anthrax bacillus.

From these experiments he learned that it was impossible in any case to disinfect such wounds, even though the antiseptic was applied immediately after the infectious material had been introduced into the wound. As antiseptics he employed not only sublimate, carbolic, lysol, zinc chloride, etc., but also caustics, as potash, nitric acid and acetic acid. All of the animals died of streptococci and anthrax sepsis.

The cause of these fatal results rests in the rapid absorption of the virus from the wounds. For example, let a mouse be inoculated in the end of the tail with anthrax, and then after a short time let the tail be amputated two or three centimetres from the root; if more than ten minutes have elapsed between inoculation and amputation, the animal will die of the anthrax disease. It is, therefore, probable that the micro-organisms enter the tissue spaces very quickly, and are soon out of the reach of disinfectants.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

**IV. Asepsis and Artificial Anæmia.** By G. NEUBER (Kiel). For the past year Neuber has used instead of the usual elastic tourniquet for inducing artificial anæmia, moistened linen bandage. The lack of durability and the dirty appearance of the elastic bandage induced him to return to the method recommended

by Stromeier. As a chief advantage, he speaks of the very much less parenchymatous hæmorrhage after the linen tourniquet band has been removed. The bandage is five centimetres wide and two and a half to five metres long. The shorter bandage can be used on the small limbs of children; the longer suffices for the limbs up to a circumference of forty centimetres; above this the elastic bandage can be employed. The extremity should be elevated for a few minutes, and then the wet linen bandage applied from below upward as far the place of constriction. After using, the bandage can be washed and ironed, and before using sterilized in boiling water. At the place of constriction it is necessary to cover a considerable extent of the limb with the bandage.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

**V. Anæsthetic Statistics.** By Dr. GURLT (Berlin). The sum total of narcoses for the year, which are included in sixty-two reports to the German Congress, amounts to 61,526. After deducting 11,464 nitrous oxide, 50,062 cases remain, with 11 deaths. The sum of narcoses for the last three years is 161,800 with 52 deaths—one death to every 3111 anæsthetizations. Out of 133,729 chloroform narcoses were 46 deaths—1:2907. 14,646 etherizations were without a single death. Mixed anæsthetization with ether and chloroform shows one death out of 4118 cases. Chloroform, ether and alcohol (after Billroth) shows no deaths among 3440. Bromethyl, 4555 cases, 1 death; pental, 597 cases, 3 deaths.

In Germany and the neighboring countries unmixed chloroform is employed more than three times as much as other anæsthetics. The glacial chloroform of Pictet is by no means perfectly safe; for during the past year three deaths have occurred out of 666 cases. The deaths from chloroform were in young persons eighteen to thirty years, and in the five autopsies which were made nothing especial was found.

Seventeen observers who reported their statistics have highly endorsed ether. They recommended it for the vigorous heart

action which it excites, the absence of the period of excitement, the rapidity with which the patient awakens from the narcosis, the speedy return of the appetite and the absence of untoward complications. In only one case, in which the etherization was continued for a very long time, respiratory syncope occurred. Gurlt concludes that undoubtedly ether is the least dangerous anæsthetic for all surgical purposes, and has the broadest field of application. Next to this, Billroth's mixture has shown the best results. Bromethyl is applicable only for short, brief narcosis. In dentistry it is found to be no less dangerous than chloroform. Pental narcosis is to be warned against.

During the last ten years 11,464 cases have been anæsthetized by dentists with nitrous oxide. Sometimes it was used pure and sometimes with an addition of a small amount of oxygen. With the pure gas cyanosis was often observed, which did not occur with the oxygen mixture. No deaths are reported. — *Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

**VI. Successful Transplantation Without a Pedicle of Skin Flaps Containing the Subcutaneous Fat.** By Dr. H. HIRSCHBERG (Frankfurt, a.M.). Hirschberg is of the opinion that the success in the transplantation of a piece of tissue from one part of the body to another depends on the amount of nutritive material its vessels can be made to hold, which may subserve the function of keeping its cells alive until they become connected with the neighboring tissue. To accomplish this he makes use of tissue which is naturally rich in blood-vessels or induces an hyperæmia by artificial means. He calls attention to the fact that by beating or rubbing a paralysis of the muscles of the veins is caused, which enables these vessels to contain a larger amount of blood.

He reports four cases of transplantation of flaps with their subcutaneous fatty tissue for defects after the extirpation of tumors. These defects he made quadrilateral in form, with borders as steep as possible. The bleeding was controlled in three cases by compression, but in the last case it was necessary to apply two fine catgut liga-

tures. While an assistant was making this compression he removed the flap for transplantation.

He applied an Esmarch bandage to the elevated arm, and made constriction in the middle of the upper arm. He then whipped the outer side of the fore-arm for two or three minutes with a sort of elastic cat-o'-nine-tails. Then a flap was cut out on three sides, which, after shrinking, should fill the defect to be repaired. The three sides of the flap having been cut out, it was lifted up and turned back upon its still undivided edge. Interrupted silk sutures were then passed from without through the flap near its free borders, and left with their needles still hanging in place. The hæmorrhage in the original wound having by this time been checked, the constriction was removed from the arm. After a few minutes the skin of the flap became red and swollen. Everything being ready for the transplantation, the flap was severed from its remaining attachment by a couple of strong cuts with the scissors. It was then laid upon the prepared surface, the threads arranged in order, and superfluous lobules of fat trimmed away from the edges. After placing the flap in its new position, the sutures were passed through the edges of the wound from within outwards and tied. In order to effect a more perfect apposition of surfaces a few very fine silk sutures were introduced between these. The fourth border was then sutured, after carefully wiping away the small amount of blood which had accumulated in the wound. A small opening was left at one corner for the escape of any further accumulation. The whole was dressed with protective gauze and cotton, retained by a moderate degree of compression.

The four cases which were operated upon after this method all healed well. The flaps appear pale during the first few hours, but on the next day they have a very normal appearance. For five or six days they retain this perfect freshness of appearance, and then begin to turn a dark bluish color. In fifteen or eighteen days their sloughs can be removed from the surface, under which can be seen the red skin surface, which in a few days resumes its normal appearance.

In this line Neuber has reported a plastic operation for a deep



funnel-shaped cicatrix following an healed bone tuberculosis. After loosening the scar from its underlying tissue, he took a piece of fat from the upper arm of the patient and implanted it in the funnel, which it completely filled. The skin was then sewed over the fat. The wound healed, and the cosmetic result was perfect.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

**VII. Bone-Filling.** By DR. SONNENBURG (Berlin). For the purpose of filling the cavities in bones by some foreign substance Sonnenburg holds that the material used must have the following qualifications: It must harden quickly, and not be poisonous, and have some antiseptic property. Then it does not become necessary to make the cavities in osteo-myelitic and tuberculous bones strictly aseptic before filling. Such materials are employed by the dentists. The experiments of Dr. Oscar Mayer, with copper amalgam, have demonstrated that this filling material not only prevents the further development of bacteria, but kills those already present. Plaster of Paris does not seem to answer the purpose, because it is too porous and heavy, and, even when mixed with carbolic solution, does not remain antiseptic. A series of experiments have been made with dogs. The filling was found completely healed in from four to six weeks. In one case a gauze sponge was accidentally left in the bone cavity with the filling material, and was found healed in. It was found in all cases that newly-formed bone substance had grown over the filling. Experiments must still be made to discover what material is best adapted in surgical practice to filling the cavities in bone.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

**VIII. Histological Observations After Bone Implantation.** By DR. A. BARTH (Marburg). The author has made a series of observations in the pathological institute of Professor Marchand, in Marburg, to determine the histological processes which take place in transplanted bone which retains its vitality. Though previous observers have come to the conclusion that a piece of bone

which has been separated entirely from its anatomical surroundings, when returned to its former place, or placed in another defect in the living skeleton, can not only become fixed, but can retain its vitality, and indeed grow, Barth has found that the transplanted bone in all cases undergoes necrosis. It may now become fixed by connective tissue encapsulation, or, as more frequently occurs, become united by a deposit of bone with the bone with which it is in contact. This last mode of healing involves a very peculiar process. It shows to the best advantage in trephine wounds of the skull, in which the button of bone has been replaced. In the early stage, about the fifth day, the button is found adherent to the dura-mater by a deposit of fibrin, while its chinks and spaces are filled with fibrin. The index of the condition of the bone is the nucleus of the bone cell, and in these transplanted bones the nuclei appear as empty spaces, or are seen to be undergoing degeneration. Now an active proliferation of connective tissue begins from the periosteum and dura-mater. The young granulation tissue grows into the spaces of the dead bone button, absorbs the fibrin coagulum, encloses in its meshes and vascularizes the dead bone as a porous foreign body. Almost immediately, sometimes after the seventh day, a deposit of new bone from the dura-mater begins, which is deposited in lamellæ through the dead bone. It is this constant depositing of layers of new bone through the dead button that is peculiar of the first few weeks. This springs not only from the dura, but also from the Haversian canals and spaces in the cut surface of the living skull, and from the border of the periosteum. The new bone is distinct from the dead bone, and is easily distinguished by the tint of its nuclei contrasted with the degenerated nuclei of the latter. This new bone formation goes steadily on from week to week, as the dead bone becomes replaced by the living. The process is peculiar, as it goes on without any anatomical sign of the old bone being absorbed. Although where the implanted bone can subserve no function, or is superfluous, as, for example, where it projects beyond the level of the skull surface, absorption by the usual means takes place. But with this absorption

the disappearance of the old bone, which fills the opening in the skull, has nothing in common. In many preparations the osteo-blasts can be seen entering directly into the old bone and forming new lamellæ, without being preceded by the formation of lacunæ. It very much resembles the cartilaginous bone formation, as is observed in the foetal long bones, in which the bone lamellæ are deposited directly in the calcified cartilage. As the substances of the calcified cartilage are of direct use in the formation of the bone, so do those of the dead bone button in the present case serve as material for the building of the lamellæ of the new bone. It is, therefore, not an absorption, in the usual sense, and subsequent substitution by new growth, but a sort of metaplasia, a substitution of the dead by living bone tissue.

This process can be best observed on the edges of the button, where the newly-formed bone lies in layers, which can be contrasted with the dead bone. The bony callus which connects the button with the skull can always be distinguished by the direction of its grain, which is transverse to the surface of the skull, and indicates the direction of the connective tissue fibres which in the beginning sprang from the periosteum and dura-mater.

Barth found the above conditions in all the specimens which he examined in which the transplanted bone was not cast off as a sequestrum. The bone became healed in in this manner only when it fitted well into the defect. The stage which the process reached depended, of course, on the length of time the animal was allowed to live after the operation. The age of the animal and its vital energy seemed also to have an influence on the rapidity of these histologico-anatomical changes. The whole process in favorable cases takes, perhaps, two months.

In the extremities, pieces of bone which have been separated entirely from all of their attachments and reimplanted, undergo the same changes. Barth resected portions of the walls of dogs' humerus and forearm, usually opening the medullary canal, and then replacing the resected piece. This in all cases died, and was either cast

off as a sequestrum or became incorporated in the callus. In the latter case, a callus grew from the marrow and periosteum and enveloped the dead bone, just as occurred in the experiments on the skull. He does not believe that the periosteum of the implanted bone has any influence over its vitality.

It is of special interest in view of these facts that macerated pieces of bone become healed in after the same method as a freshly implanted piece. Barth made a number of experiments, in which he replaced the trephined buttons after they had been macerated in potash and stained with boiling carmine solution. In the most cases, connective tissue encapsulation took place. In two cases bony healing occurred, and the buttons were found, microscopically, to have undergone the same depositing of new bone lamellæ as was observed in the freshly implanted cases.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

JAMES P. WARBASSE (Brooklyn).

#### OPERATIVE SURGERY.

**1. Resection of the Rectum, with Transverse Separation of the Sacrum.** By Dr. LEVY. Levy proposed, more than three years ago, a method of resection of the rectum, the prominent features of which included the proposition to (1) leave intact the lower or external anal sphincter; (2) to preserve the coccyx; (3) to avoid injury to the levator ani.

He has more recently modified his procedure as follows: An arch-shaped incision is made, through the skin and fascia, over the lower end of the sacrum. This is located a finger's-breadth above the points of the cornua of the coccyx. Laterally it is continued upon either side to a point five centimetres from the tuberosity of the ischium and parallel to the course of the fibres of the gluteus maximus. Below the fourth sacral foramen the incision is carried to the bone, the lateral muscular fibres are separated by a blunt dissection until the lateral edges of the greater sacro-sciatic ligament is reached.

This is carefully divided upon a grooved director. A chain saw is now introduced in front of the sacrum, a special elevator being used to separate the soft parts upon its anterior surface; the chain saw is passed between these and the bone.

The flap of bone and skin is now drawn downward, the coccygeus and sacro-sciatic ligaments being still further divided, if necessary. The pudendo-hæmorrhoidal and the fourth sacral nerves are not injured by this procedure. In case an insufficient amount of space is afforded, the osteo-plastic flap may be divided longitudinally. —*Berliner klinische Wochenschrift*, 1893, No. 13.

**II. Technique of Extirpation of the Uterus by the Sacral Way.** By Dr. HOCHENEGG. This is a repetition of the author's proposition for the sacral method of extirpation of the uterus. His present method of operating is as follows: The skin incision is commenced in the median line one centimetre above the sacro-iliac joint, and extends to the anus, includes this on the left side, and terminates upon the perinæum in the median line. In the upper portion of the region included in this incision the tissues are separated to the bone; below, the incision is carried only to the lower peri-rectal connective tissue. At the perinæum the skin only is separated. The coccyx is now removed, and the rectum isolated upon the left side; upon the right and anteriorly it remains intact to the attachment of the posterior vaginal wall, the left side of which is exposed without difficulty. The blade of a scissors is now introduced into the vagina, and this is split its entire extent, unless it is invaded by carcinoma, in which case the incision with the scissors stops short of the neoplasm. In the upper angle of the wound the rectum is loosened from the posterior uterine surface by blunt dissection. The entire posterior surface of the uterus and annexa are brought into view. The latter may now be conveniently and safely separated from the bladder; the ureters may be identified and avoided; the vessels sought and ligated. After removal of the uterus, any portion of the vaginal wall may be removed if found to

be diseased. The opening into the peritonæum may be now sutured with buried sutures, the rectum replaced and held in position also with buried sutures; the remainder of the vagina is sutured; the external wound is packed with gauze, sutured for a portion of its extent, provision being made for drainage. During the after-treatment the patient maintains the dorsal position, with the pelvis somewhat elevated.—*Wiener medicinische Wochenschrift*, No. 24, 1893.

GEORGE RYERSON FOWLER (Brooklyn).

#### HEAD AND NECK.

**I. Trephining for Hæmorrhage After Fracture of the Base of the Skull.** By Dr. STENZEL (Küstrin). The author reports the case of a laborer who fell 1.5 metres, striking his head upon a cement floor. He presented insensibility and vomiting. The consciousness returned, and ptosis of the left eye developed. He mounted two flights of stairs and fell to the floor unconscious. Stenzel saw him two hours later, and discovered unconsciousness, pulse fifty, left ptosis, and paralysis of the muscles of the right side of the body. There was no bleeding from the ears or nose. On the following day the left eye-lids were found deeply injected with blood, and the other symptoms remained unchanged. With the diagnosis of hæmorrhage in the left middle fossa of the skull, he performed a trepanation forty-eight hours after the injury. A large exudate of blood was found between the dura and the skull, and the bleeding continued when this was removed. This was controlled by a tamponade of iodoform gauze, which was renewed on the second day. A week after the injury the bleeding had ceased, and the flap of bone and scalp was replaced. After the operation the patient soon returned to consciousness with the symptoms of aphasia. Healing per primam, and ultimate recovery.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.



## **II. A Case of Trigeminal Neuralgia Cured by Stretching the Facial Nerve.** By DR. SCHULZE-BERGER (Oberhausen).

The author remarks that the operative treatment of trigeminal neuralgia during the last decade has progressed in the direction of removing more and more of the nerve, until finally the operation has even been carried within the cranial cavity. Without resorting to any formidable operation, he has succeeded in curing a severe trigeminal neuralgia, with clonic cramps of the facial muscles, in a woman who had suffered for six years. The operation consisted in stretching the left facial nerve.

The operation of stretching the nerve eliminates its function without permanently injuring it. The cause of the cure depends on mechanical changes, and is not reflex. As a result of the operation the spasmodic contractions of the muscles of the cheek were checked, and, therefore, the pressing and pulling of the trigeminal branches running through these muscles were prevented.

This rest from irritation exercised such a salutary influence that five days after the operation the neuralgic attacks ceased, and did not return, while in the course of a few months the function of the facial nerve became restored.

The question as to whether all trigeminal neuralgias with clonic facial spasm can be cured in this manner, or only those, as the above case, which depend on the facial cramps for the exciting cause of the pain, can only be decided by further observation.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

## **III. The Operative Treatment of Congenital Cleft Palate.** By DR. E. KÜSTER. Küster gives a report of the cases upon which he has operated, twenty-two in all, ranging in age from two to forty years. Nine of these were males, and thirteen females. Fifteen were cured, and the remaining seven were either somewhat improved or not helped at all. The last ten cases operated upon were all cured.

Certain peculiarities in the operation as he performs it may be mentioned. He makes a small flap out of the uvula on either side,

after the fashion of Malgaigne's operation for hare-lip. By this means a lengthening and broadening of the uvula is affected, and at the same time a moderate degree of elongation of the soft palate. The rest of the operation is carried on after the method of Langenbeck, excepting that in all cases the nasal mucous membrane is cut through transversely at the posterior border of the hard palate. The movability of the hard palate is thereby greatly increased. The sutures are applied with Küster's swan needle holder, by which the operation can be completed in half an hour. The introduction of tampons into the lateral cuts should be avoided as much as possible, because they often are the cause of a broad lateral opening between the mouth and nose. When they have to be introduced on account of hæmorrhage, they should be removed after a few hours.

He does not believe in early operation, but regards the sixth and seventh years as the best time for operation.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

#### IV. The Functional Results of Early Urano-plasty.

By Dr. JULIUS WOLFF (Berlin). Wolff presented to the German Surgical Society a seven-year-old lad in whom he had performed the operation for cleft palate at the age of thirteen months. Two months after the operation the talking exercises by Gutzmann were begun. He can now speak perfectly clearly and without a nasal accent.

Another boy operated on at the age of fifteen months, who also pursued the exercises of Gutzmann, showed an absolutely perfect result. He also obtained as good result in a child operated on at the age of four months.

Early operations for cleft palate, according to the opinion of surgeons before now, are dangerous and uncertain. Wolff denies this, and claims that the only increase of danger is from improper controlling of hæmorrhage. He believes, furthermore, that the operation properly performed during the first year is really salutary; and also in children which have passed the first year and have not perished from the deformity, a successful operation will improve very

greatly the general health, because a normal condition of the breathing and swallowing, and in many cases of the hearing, is brought about. As to the certainty of the operation it can be assured by a proper application of the sutures.

He rejects entirely Küster's method of suture, because whatever advantage it has in increasing the length of the velum, it loses in the breadth and causes the palate to be small and stretched so that it does not fit well into the pharynx. The great advantage claimed for early operation is that the nourishment and the speech of the child are corrected at an early date when they can be of the most advantage, for these children can hope to have their speech entirely corrected as well as their nourishment improved, whereas operation performed upon older children cannot correct the faulty articulation.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

JAMES P. WARBASE (Brooklyn).

#### V. Struma Tuberculosa. By Prof. P. BRUNS (Tübingen).

The writer finds tuberculous goitre to be very rare, and a case is not recorded where the disease has attacked the thyroid gland in the form of a large goitre. The case which forms the base of this work has been carefully studied clinically and histologically. It is of general interest, as the clinical picture was that of a malignant goitre. A goitre which before was soft and of some size suddenly becomes hard upon one side, somewhat nodular and grows rapidly, while pains appear and the neighboring glands swell. The thyroid gland was thickly beset with large tuberculous nodes—a form of thyroid tuberculosis which, excepting miliary tuberculosis, is extremely rare. Only six cases are known.—*Beiträge zur klinischen Chirurgie*, Bd. x.

#### VI. Laryngectomies at Kocher's Clinic in Berne. By

O. LAUZ (Berne). This work presents a report on twelve laryngectomies done during ten years at Kocher's clinic in Berne, including total extirpation, resection and excision of soft parts. Lauz proposes the following terms: Superior laryngotomy (thyrectomy), inferior

laryngotomy (cricotomy), and median laryngotomy (incision of the crico-thyroid membrane). An ordinary sponge is tied around the tracheal canula. The laryngeal wound is either treated open, with iodoform gauze tamponade, or the edges of the wound are brought together over the gauze by a few sutures. Iodoform gauze has not been much used of late years on account of several cases of poisoning. To prevent broncho-pneumonia, which was observed in none of Kocher's cases, he recommends the following measures: Separate the tracheal and laryngeal wounds as much as possible, if necessary suturing the trachea in the lower portion of the wound, frequently changing the tampons and carefully wiping out the wound. The tampon canula is replaced immediately after the operation by an ordinary one. Food is not taken in the recumbent position, but by means of an œsophageal sound introduced through the mouth. As to the cases themselves, in the majority it was carcinoma, in one lupus (unilateral extirpation), once tuberculosis (extirpation of the greater portion of the larynx) and, finally, an extension of a sarcomatous struma (partial resection of the larynx and trachea). Three times complete removal of the larynx and three times resection of the fauces and œsophagus was done. Tracheotomy was in seven cases done at the time of the operation, and in the remainder performed beforehand. As to the results, but one patient died immediately after the operation. The patient with lupus died in three years of pulmonary tuberculosis, and the one with tuberculosis in four weeks, with phthisis. The patient with a sarcomatous struma was free from recurrence after two years. Of the patients with carcinoma, one died in two years of pleuro-pneumonia, probably free from recurrence; of a second it was only reported that he had had no recurrence after six months; a third was well fourteen months after the operation (excision of vocal cord). The others succumbed within four months to one year and seven months, to recurrences. Though the immediate course in these cases was good, the permanent results were not better than ordinary, due to the cases being far progressed. Although he is a warm advocate of laryngectomy he would

have partial extirpation, with its good functional results, performed early.—*Archiv. für klinische Chirurgie*, Bd. XLIV, Hft. I.

FRANK H. PRITCHARD (Norwalk, Ohio).

#### CHEST AND ABDOMEN.

**I. Primary Carcinoma of the Nipple.** By G. MANDRY (Tübingen, Germany). The writer operated on a woman of sixty-one years, who presented a tumor of the nipple of the size of a pea, which on microscopical examination proved to be an epithelial carcinoma. He extirpated the entire mammary gland and cleaned out the axilla. The patient recovered without complication. Mandry regards the orifices of the galactophorous ducts as the primary seat of the disease. Examination of German literature revealed but very few cases, while foreign literature yielded a number of cases under the term Paget's disease, that were partly epithelial carcinomata.—*Beiträge zur klinischen Chirurgie*, Bd. x.

FRANK H. PRITCHARD (Norwalk, Ohio).

#### EXTREMITIES.

**I. Treatment of Severe Injuries of the Extremities.** By P. RECLUS (Paris). In grave injuries of the extremities, as from railroad accidents, machinery, etc., the writer rejects primary amputation, or exarticulation, for various reasons. In the first place, the shock will only be increased by operation, and again, it is impossible to determine, in the crushed tissues, the living tissue from that which will necrose. Hence in such cases it is best to proceed most conservatively. Wrap the patient in warm clothes, and inject subcutaneously caffein, ether or artificial serum. Then cleanse the injured member by energetically irrigating it with sterilized water at 55-60 Raumer. Every corner and crevice should be cleaned, the water at this high temperature being both hæmostatic, disinfectant and warming. Then pack all portions of the wound with a weak iodoform

gauze, or a gauze containing a salve of boric acid, antipyrin, salol or iodoform, and the limb finally wrapped in cotton batting. In the course of four weeks the necrotic tissue will have separated from that which is living, and the bone only remains to be severed if amputation be required. The soft parts will then heal quickly as they are granulating. Two cases are used to illustrate the application of these principles. They were a crushed foot and leg and knee respectively. —*Gazette des Hopitaux*, No. 17, 1893.

**II. Treatment of Fracture of the Femur in the New-born.** By C. J. ELLEFSON (Christiana). The writer has recently had opportunity to try a method of treatment of this form of fracture which he found recommended in Bouchut's *Maladies des Enfants*. Fracture of the femur in the new-born is accompanied by difficulties which can only partly be overcome. The various kinds of bandages which have been employed are nearly impossible to keep clean and dry; frequent changing interferes with healing. At a breech presentation where the midwife was so unfortunate as to break the femur at about an inch from the hip joint, he was called to dress the fracture. Two splints were applied, covered with flannel and corresponding with the anterior and posterior surfaces of the femur; then cotton wadding, and around the whole a circular bandage. The thigh was fixed in extreme flexion upon the child's abdomen by a few turns of the bandage. A little cushion is placed between the child's leg and thigh. The few turns of circular bandage will naturally become wet through, but they can be changed easily without disturbing the fracture. After fifteen days the bandage was removed and the fracture was found to have healed without shortening or disfiguration of the thigh. The forced flexion of the thigh and fixation to the abdomen did not seem to have disturbed the infant, which was perfectly well during the whole time.—*Norsk Magazin for Lægevidenskaben*, No. 7, 1893.

FRANK H. PRITCHARD (Norwalk, Ohio).



## REVIEWS OF BOOKS.

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BRAIN SURGERY. By M. ALLEN STARR, M.D., Ph.D. 8vo., 295 pages. New York: William Wood & Co., 1893.

ALTHOUGH by its title one would classify this book with those intended for surgeons only, the work is really of chief value to the general practitioner, who from time to time may have under his observation patients who are suffering from some one of the various forms of brain disease in which the question of operative interference arises. Few men have the time to read such elaborate treatises as those of Gowers or Hirt, but in this book by Starr (together with his book on Nervous Diseases), it is possible to go over the entire subject quickly, and arrive at a satisfactory diagnosis. In the operative domain of nervous diseases, especially in those operations which have to do with the brain, the best literature upon the subject is scattered widely through various medical publications at home and abroad, and this, as the author says in his preface, "is accessible to those only who have a large medical library at their disposal, and who have the time for literary research."

The diagnosis is of primary importance, and is essential before surgical treatment is attempted. The first chapter of the book is devoted to the diagnosis of the nature of the cerebral lesion, of its situation and of the essential facts of localization. Cerebro-cranial topography is fully discussed, and the illustrations given add greatly to the value of the text itself.

Under surgery proper the operation of trephining for the relief of epilepsy, imbecility due to microcephalus, cerebral hæmorrhage, abscess of the brain, tumor of the brain, hydrocephalus, intra-cranial pressure, insanity and headache are each made the subject of a chap-

ter. Each chapter gives reports of cases, for the most part those of American surgeons. Those coming under the writer's own observation, and referred to some surgeon for operation, are especially valuable on account of the accurate and complete history of the localization symptoms, and the conclusions derived therefrom, which are given.

Trephining for epilepsy is the subject given the greatest amount of space. The varieties of the disease, including the various forms of attack (motor, sensory, aphasic and psychical), noticed in cases of the Jacksonian type, are briefly discussed. Traumatic epilepsy is more elaborately treated, and numerous cases cited, with a diagram of the opening made in the skull in nearly every instance. Unfortunately for the value of these statistics, the cases are nearly all so recent as to materially detract from the conclusions as to the final result. Of thirteen cases conducted under the personal observation of the author, only three are claimed as cures. Examination of the detailed reports reduces these cases to two, Cases I and V, the first of which has a post-operative history of but four months, and the second of but three months. The pathology of some of these cases, as worked out and illustrated by Dr. Van Gieson, is interesting and instructive, the conclusion being that Jacksonian and traumatic epilepsy are always due to a pathological change in the brain. The summary of the conclusions drawn is that a majority of chances are against cure as a result of operative interference, but as it is the only method of treatment which affords any hope whatever, and as it is a method which is fairly safe, operative attack is justifiable.

The results shown in trephining for traumatic hæmorrhage (non-traumatic hæmorrhages being very seldom open to an operation), and for brain abscesses following injury, or otitis media, are more satisfactory, providing the localization symptoms are recognized and the site of the lesion is clear. In case a brain tumor is the cause of the disturbance, much can be learned from the analysis of 600 tumors which Dr. Starr gives. The importance of purely mental symptoms which may arise is well illustrated by a case of a sarcoma of the left

frontal lobe, which was localized and removed by Starr and McBurney.

For those practitioners, who by force of circumstances are expected to be proficient in all departments of medicine, the last chapter, devoted to the operation of trephining, is likely to prove the most valuable in the book. It has been revised by Dr. McBurney, and the technique, which is minutely described, is the result of the most recent advances in this realm of surgery.

H. P. DEFOREST, M.D. (Brooklyn).

LESSONS IN PHYSICAL DIAGNOSIS. By ALFRED L. LOOMIS, M.D., LL.D. Tenth edition, revised and enlarged. 8vo., 240 pages. New York: William Wood & Company.

This book upon Physical Diagnosis by Dr. Loomis is too well and favorably known to need any detailed description as to its scope and character. The tenth edition has just appeared, and in the preface note the author says that it has been thoroughly revised. Upon careful examination, however, one regrets that the revision has not been more complete, and that a book which has so many good qualities should also have so many glaring defects. When it is compared with a work like the recent one by Wesener, upon the same subject, and designed for the same purpose, *i. e.*, a complete and concise guide for both student and practitioner, the inferior quality of Dr. Loomis' book is all the more apparent.

The main portion of the book is devoted to the physical examination of the thoracic viscera, and here the author appears to the best advantage. His style is concise, his opinions positive.

In the other chapters the same high standard is not maintained. To point out in detail all of the errors and omissions is undesirable, yet some of them should certainly be mentioned. The chief subject which one would naturally expect to find in such a work, and which is omitted, is physical diagnosis as applied to the more common forms of nervous diseases; the ophthalmoscope is dwelt upon at some

length, as well as a few other instruments of minor importance in the diagnosis of these diseases, and this completes the subject.

In the chapter devoted to mechanical aids in the diagnosis of diseases the instruments described are those in vogue ten years ago; modern improvements are rarely referred to. The many ingenious and valuable appliances in which the electric light is used as an aid in the examination of the accessible cavities of the body are not described. The endoscope is named only, but the cystoscope is not. Four lines are devoted to the entire subject of specula for the ear, vagina, rectum and urethra. The microscope and its use are hastily described, the use of the condenser is omitted, as well as other important details. An instrument so limited in its sphere as the Liebreich ophthalmoscope can be recommended only on the ground of cheapness. There are better stethoscopes to-day than the one "devised by the late Dr. Cammann." The nasal speculum of which a picture is given has been superseded by better ones. Certainly the best sphygmograph is not that of Marey. Even the thermometer represented is a poor one, and the method "of repeated sudden blows of the wrist upon the knee" is *not* to be recommended. There are a number of good pulse tracings given, but no temperature curves—a fact which detracts materially from the value of the section devoted to the range of temperature in health and in disease. A page of plates representing the typical laryngeal images would be of great assistance to the beginner in laryngoscopy.

The chapter upon the examination of urine is an improvement upon the ones in previous editions, but still there are many new and valuable tests omitted, while others of little use are retained.

Similar errors and important omissions are found throughout the book.

The book is better printed than previous editions, and while most of the illustrations are only passable, those taken from the drawings by Dr. Byron and reproduced in colors are well executed and of value. The photograph of the *Filaria sanguinis hominis* is especially good.

Against our inclination we are forced to conclude that the book is one which adds to the difficulties which a physician has to contend with when he tries to select a working library. When a medical work is first published it usually embodies the most recent and advanced ideas upon the subject discussed, but if one prefers books of the older writers, and buys the so-called "revised editions," in many cases he finds the revision is incomplete, not up to date, and generally unsatisfactory. Examples are numerous. How many of the revised editions of the various "surgeries" published will give the practitioner an accurate working knowledge of modern aseptic surgical technique? Which of the "standard chemistries" will satisfy the desire of a person seeking information concerning recent achievements in synthetical manufacture? The sale of many of these books is large, not because of their real current value, but because of the reputation of the author, gained years ago. The effect of the sale is bad. If they fall into the hands of a student, he starts in his practice handicapped by the use of inaccurate books of reference; if the old practitioner buys them, thinking thus to keep in touch with the best work of the day, he soon detects the many errors, the book is laid away, he regrets the useless expense, and the author loses one more of his former admirers.

H. P. DE FOREST (Brooklyn).

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TRAUMATISMS AND TRAUMATIC ANEURISMS OF  
THE VERTEBRAL ARTERY AND THEIR  
SURGICAL TREATMENT, WITH THE  
REPORT OF A CURED CASE.

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I.

THE operative surgery of the vertebral artery may be truly said to be an acquisition of the latter part of this century.

Up to 1860, but a few names would have sufficed to cover the whole bibliography, the names of Dietrich, Velpeau, Nunziantè Yppollito, Sedillot, Fraeys, Chassaignac, Laudi and Maissonneuve, would have completed the list of the most important authors who had given any personal attention to the subject. The majority of the great writers of the period referred to, such as A. Cooper, Lisfranc, Larrey, Vidal, Malgaigne, Guérin, Beraud and Follin taught practically that the vertebral artery was of scarcely any interest to the surgeon.

The spirit of the times was reflected by Sanson, of Paris, in his Treatise on Traumatic Hæmorrhages, which was published in 1836. In commenting upon a case of injury to the vertebralis, he said: "The vertebral artery cannot be ligated, on account of its great depth, nor compressed, because of the osseous canal which protects it; it can still less be cauterized. The wounds of this vessel are beyond the resources of art."



In 1853, the accomplished Maisonneuve<sup>1</sup> proved that this teaching was erroneous, for, in a remarkably daring search (for the period, it was a very bold feat) for the bleeding vessel in a wound of the neck, he, aided by Favrot, successively ligated the inferior thyroid and the vertebral as it entered the canal of the transverse process of the sixth cervical vertebra. This had never been done before and the gravity of so unparalleled a procedure as the ligation of the vertebral artery, can be gleaned from Maisonneuve's and Favrot's report, when they say, with a solemnity which sounds somewhat strange to our *fin de siècle* surgery, "It was suspected that the hæmorrhage came from the vertebralis. In the presence of so grave a contingency, for the relief of which the records of surgical experience suggested no remedy, we hesitated, and for a moment felt uncertain as to the proper plan of action. But the life of the patient was involved and we had to stop the hæmorrhage at all hazards," and this they did admirably and with perfect success.

We find that as early as 1833, Velpeau<sup>2</sup> suggested that the ligature of the vertebralis, in its first portion, was a feasible operation and could be effected by an incision in the space between the sternal and clavicular heads of the sterno-cleido mastoid, as previously suggested by Sedillot for the ligation of the common carotid. Dietrich,<sup>3</sup> in 1831, proposed two methods for the ligation of the upper part of the vertebralis, one for tying the artery in the occipito-atloid region and the other in the atlo-axoid, or first intertransverse space. In 1834, Respoli,<sup>4</sup> of Naples, while witnessing the ineffectual efforts that were being made by a colleague (Ramaglia's case), to control the bleeding

<sup>1</sup> Maisonneuve and Favrot: *Journal des Connaissances Medico-Chirurgicales*, Paris, 1852, 2 s., Vol. II, p. 181.

<sup>2</sup> Velpeau: *Nouveaux Éléments de Médecine Opératoire*, Paris, 1839, T. 2me p. 221.

<sup>3</sup> Dietrich: *Das aufsuchen der Schlagadern*, etc., p. 81, 1831, Neurenberg. Vide also Chelius' Surgery.

<sup>4</sup> Respoli: Quoted by Nunziante Yppollito, *Annali Clinici*, Napol, 1835. Also in pamphlet on "Ligatura dell' Arteria vertebrale nei casi di aneurismi della stesa," 1838. Also quoted by A. Gherini in *Memoire on "Ferite dell' Arteria Vertebrale,"* Milano, 1867.

from a stab-wound of the vertebral artery, suggested that this vessel should be ligated *en masse* by passing a curved needle through the bleeding intertransverse space thus enclosing all the soft parts within the ligature.

In 1835, Nunziante Yppolito,<sup>1</sup> who had also had personal experience with the difficulties in the way of completely controlling the bleeding in injuries of the vertebral artery, concluded, after an able study of the subject, that the ligation of the vertebral in its first portion, was perfectly justified for the control of hæmorrhage, and that a ligature could best be thrown around it by making an incision on the outer border of the sterno-mastoid. Unfortunately, he had no experience on the living subject with his method, though it was almost identical with the procedure independently adopted by Smythe, of New Orleans, in his memorable case, and which is now frequently referred to as "Alexander's method."

In 1848, Fraeys,<sup>2</sup> of Gand, described a method of securing the vertebral by making an incision on the inner border of the sterno-mastoid, which was very much enriched by the admirable topographical suggestions of Chassaignac, whose masterly studies on the importance of the anterior tubercle of the sixth cervical vertebra as a guide in this operation, caused it to be named after Chassaignac rather than in honor of its true originator—Fraeys.

Finally, the lamented Barbieri, of Milan, whose "Monograph on the Vertebral Artery" will ever remain an imperishable monument to his prodigious erudition, summarized, in 1867, all

<sup>1</sup> Vide supra, loc. cit.

<sup>2</sup> Smythe's operation was performed as follows: The head of the patient was thrown backward and turned slightly to the left, an incision two inches long was made from a little above the clavicle along the posterior border of the sterno-mastoid muscle. The edge of the muscle having been exposed and drawn aside, the prominent anterior tubercle of the transverse process of the sixth cervical vertebra, was readily felt and taken for a guide, the artery lying vertically below it. A layer of fascia was divided, some loose cellular tissue with lymphatics and the ascending cervical artery was pulled to the inner side of the scalenus anticus and longus colli muscles which were separated from each other close to their insertion into the tubercle, when the artery and vein became visible. The vein was drawn to the outer side (a point of importance, according to Dr. Smythe), and the needle was passed round the artery from without."

the arguments in favor of the ligation of the vertebral and laid down all the details of the technique for its *typical* ligation, in ignorance, however, of the successful demonstration of the practicability of this operation on the living subject that had been given to the surgical world in 1864, by Andrew W. Smythe, of New Orleans. This operation is the most towering landmark in the surgical history of the vertebralis, and in conjunction with the first successful ligation of the innominate artery for the cure of subclavian aneurism, with which it was performed as an auxiliary measure is justly recorded in the classics as one of the most brilliant achievements of American surgery.

The operation performed by Smythe, although classical, deserves more than passing mention because it was the first systematic and carefully premeditated, as well as successful, attempt to control the vertebralis at the point of election in the root of the neck. The object of the ligature of the vertebralis was, in this case, to cut off the collateral supply from the circle of Willis to a subclavian aneurism.

The patient was William Banks, a mulatto, aged thirty-two years, who consulted Dr. Smythe for the relief of an aneurism of the right subclavian artery, which filled the posterior-inferior triangle of the neck, and which had resulted from muscular strain in the efforts made by the patient to save himself from drowning in a collision at sea. On May 15, 1864, a silk ligature was placed on the innominate artery, a quarter of an inch below its bifurcation and another ligature was also applied to the common carotid, an inch above its origin. Repeated and profuse secondary hæmorrhages took place at various intervals, which threatened the life of the patient, as in all previous cases in which the ligature of the innominate had been attempted and in spite of the ingenious method of hæmostasis resorted to by Dr. Smythe, viz., the filling of the bleeding wound with fine shot. In view of the impending danger and being satisfied that repeated occurrence of the bleeding in the fatal cases of this operation could all be accounted for by a retrograde current through the vertebral, the hæmorrhage coming directly from the brain, the bold operator decided to ligate this all-important collateral.

He says: "Having satisfied myself by repeated attempts on the subject that the vertebral artery could be ligated just before it enters the foramen of the sixth cervical vertebra, through an incision made along the outer edge of the sterno-mastoid muscle, and the aneurism having diminished enough in size to permit of the operation, I determined to try it, and, on July 8 (fifty-three days after the ligation of the brachio-cephalic), with the assistance of Dr. P. C. Boyer, a ligature was placed on the vertebral artery.<sup>1</sup>

No further hæmorrhage took place. The ligature came away from the vertebral artery on the tenth day and on the fifteenth day of September, the wound had healed, and the *first* successful typical ligation of the innominate and vertebral arteries recorded in the annals of surgery, was an accomplished fact.

After the publication of Smythe's brilliant operation, the ligation of the vertebralis soon became one of the classical acquisitions of surgery, especially since the safety of the aseptic procedure has been so frequently demonstrated in the heroic, but ineffectual attempts to cure epilepsy by the ligation of both vertebrals, as first practiced by Alexander, of Liverpool, who, alone, operated thirty-six times, with only three deaths, and who has been followed by Bernays, of St. Louis, Chalot, of Toulouse, France, and others.

## II.

The class of injuries which are about to engage our attention are fortunately of great rarity<sup>2</sup>—fortunately indeed, for when

<sup>1</sup> New Sydenham Society's Biennial Retrospect for 1885-6, From N. O. Medical Record, and Mott's Velpeau, Vol. II, p. 229; also New Orleans Charity Hospital Report for 1876.

<sup>2</sup> Some idea of the comparative rarity of the wounds of the vertebral can be obtained when we consider that in the sixty years that have elapsed from the foundation of the New Orleans Charity Hospital, from 1832 to 1892, during which period 463,894 patients have been treated within its walls, but one case of wound of the vertebral has been recorded in the Annual Reports, and that was the traumatic aneurism that came under my observation, and that has been described in this paper at some length. Stone's case was treated in his private infirmary, and would be the second recorded case from New Orleans, up to 1893.

In consulting the surgical history of the War of the Rebellion, second volume, we find that out of a total of 2235 cases of arterial hæmorrhage of head, neck, chest,

they do present themselves for treatment they are well calculated to cause no little worry to the surgeon whose judgment, courage and resources are usually taxed to the utmost by a combination of complications and obstacles that experience teaches are thrown in the way of his curative efforts, in a manner that is hardly paralleled by any other class of vascular injuries. It is hardly necessary to dwell long upon the reasons for the peculiarly grave character of the traumatisms that involve the vertebral artery. A glance at the surgical anatomy of this vessel as it lies deeply hidden in the skeleton of the neck, only escaping at very short intervals from its osseous canal, to become immediately invested by very important and vital cervical nerves as they issue from the spinal foramina, will at once remind us of the magnitude of the purely technical difficulties in the way of its atypical ligation, and of the errors of diagnosis that must be incurred, owing to the proximity of so many large arterial trunks.

Furthermore, its unique termination in the cranial cavity, where, anastomosing directly with its fellow artery, it becomes continuous with the carotid system through the circle of Willis—will also convince us of the unreliability of the ligation of this artery, whether proximately or distantly applied, as a permanent means of controlling the blood supply of any aneurismal tumor that may be situated between either one of its cervical extremes.

One of the initial difficulties that are usually presented by aneurisms of the cervical portion of the artery is that of their differential diagnosis from similar tumors connected with the carotid trunk and its branches. That this difficulty is not fanciful, but real, is most eloquently proved by the fact that in more than sixteen out of thirty-six traumatisms of the vertebral artery (or  $44\frac{2}{3}$  per cent.), hæmostasis was attempted by ligation of the common carotid as the presumed source of hæmorrhage; in

trunk, and upper and lower extremities in which the bleeding vessels were indicated by name, only two cases (one a primary injury, the other a secondary) are attributed to the vertebral (Table C, XXIV). These hæmorrhages were furnished by a grand total of 245,790 gunshot wounds, and 922 sabre and bayonet wounds, which were inflicted during the Civil War, from 1860 to 1865.

these cases either the carotid alone, or together with some other artery (the inferior thyroid, Maisonneuve ; the occipital, Fenger) was ligated first, instead of the culprit vertebral, the error being recognized only *post operationem*. The necessity for correct differentiation is, therefore, manifest, and its importance cannot be over-estimated, especially when we consider that the ligation of the common carotid, under these circumstances, is fraught with especially harmful consequences. As Timothy Holmes<sup>1</sup> correctly stated : " In the first place, by throwing the strain of the anastomosing circulation on the vertebral, it tends to aggravate the disease it was meant to cure, and in the second, if the circulation in the wounded vertebral artery is interrupted before the operation (which to some extent it almost certainly must be), the stoppage of the supply from the carotid artery is rendered doubly perilous to the nutrition of the brain."

The explanation of the frequency with which this error of ligating the common carotid for the vertebral has been committed is solely to be accounted for by the topographical relationship between the two arteries, and the facility with which pressure upon the common carotid at the root of the neck will control the circulation of the vertebral. This fact was distinctly pointed out by Fraeys, of Ghent, in 1848,<sup>2</sup> and can be easily demonstrated by repeating this observer's experiments on the cadaver. " After having removed the skull cap and the contents of the cranium, taking care to cut the vertebral arteries below their junction in the basilar, tie the axillary arteries and the upper part of the abdominal aorta, then inject water through the arch of the aorta. The liquid will be shot out through the two internal carotids and the two vertebrals at the base of the skull. But as soon as even slight pressure with the finger is put on the course of the common carotid, in the space extending between two or three inches above the clavicle, between the trachea and internal border of the sterno-mastoid, the jet will no longer flow from either the internal carotid or vertebral, on the side com-

<sup>1</sup> Surgical Treatment of Aneurism in its various Forms, London Lancet, July 26, 1873.

<sup>2</sup> Annales de la Societe de Medecine de Gand, 1848, p. 211, Vol. xxi.



pressed, but will recommence as soon as compression is removed. If both sides are compressed at once *all* the arteries cease to squirt. If pressure is made with the same force on the common carotid *above* the "carotid tubercle" (*i. e.*, the anterior tubercle of the transverse process of the sixth cervical vertebra), the space below that tubercle being left free, the jet from the internal carotid wholly ceases."

As stated by T. Holmes, <sup>1</sup>"the surgeon who, knowing the true position of the transverse process of the sixth cervical vertebra, and knowing that pressure applied along the course of the carotid anywhere below this, *i. e.*, for two inches, at least, above the clavicle, will most probably stop the pulsation in the vertebral also, will not conclude that the aneurism affects one of the carotids, or some branch of the external carotid, until he has seen that pressure also stops the pulsation when applied on a higher level, or when applied to the carotid by lateral pinching of the sheath through the relaxed sterno-mastoid muscle, as recommended by Rouge, and effectually practiced in the case here reported.

The importance of Rouge's lateral method of compression should not be forgotten, when we consider that the vertebral not infrequently takes an anomalous course in front of the vertebral column, and avoids the sixth transverse process to enter into a transverse foramen much higher up, selecting even that of the third and second vertebræ. Under these circumstances direct compression backwards upon the common carotid, no matter how high above the carotid tubercle, would be sure to compress the vertebral, as well as the common carotid arteries, and thereby make the experiment fallacious.

Another lesson that is reinforced by experimental evidence is the demonstration of the great freedom of the collateral circulation of the vertebral through the circle of Willis. If the vertebral be exposed through its whole length in the neck by laying open the vertebro-transverse canals with a costotome and gouge forceps, and the artery be divided in the middle of its course, an injection of water into the aorta will immediately cause a flow

<sup>1</sup> *Loc. cit.*

through both the divided *distal* and *proximal* ends by streams of equal size and velocity. If a separate receptacle is attached to each end of the divided artery, both will fill up at the same time, proving that the supply of blood from the distal and proximal end is simultaneous and practically equal. The bearing of this experiment upon the treatment of traumatic aneurism by the ligation of the vertebral trunk at its origin is obvious.<sup>1</sup> No definitive cure could always be expected by such a procedure, since the supply from the cranial side would be as great as from the proximal side; the only rational hope for success by systematic ligation would be to attempt the combined ligation of the distal end, in the sub-occipital triangle, by Dietrich's method, and that at the proximal end by either Smythe's or Alexander's method. But the ligation of the vertebral artery on the distal side in a case of traumatic aneurism is not only impracticable but tantamount to the Antyllian operation, for in the vast majority of cases the aneurism already occupies the sub-occipital space, and the artery can only be secured by the incision and evacuation, or displacement of the aneurism. The cases of aneurism, in which the tumor occupies a region far enough from both the points of election to make the ligation practicable, have not yet presented themselves, and it is probable that such a procedure will never be realized, or if it is at all carried into execution, it is very doubtful that it will be associated with less traumatism than that which is connected with a direct attack upon the aneurismal sac by any of the modifications of the method of Antyllus.

So much, therefore, for the *a priori* experimental and anatomical evidence. Let us now listen to the teachings of experience.

### III.—REMARKS ON PRIMARY BLEEDING FROM INJURIES OF THE VERTEBRAL ARTERY.

It is impossible for us to draw any definite and safe conclusions as to the best course to pursue when confronted by so grave

<sup>1</sup>In cases of wounds of the vertebral, in which the artery has been completely divided both ends of the artery may bleed with equal vigor, as, *e. g.*, was well demonstrated by Kocher's patient (No. 15; Table II).

an injury as a wound of the vertebral artery without consulting the lessons of the past and gathering from all reliable sources those teachings of actual clinical experience which are most rational and have furnished the most salutary results. To satisfy my own inquiries I have searched all the available literature at my command for reports of cases, and have succeeded, with the valuable assistance of the distinguished librarian of the Surgeon-General's Office, Dr. Billings, in collecting fifty-three cases of lesions of the vertebralis.<sup>1</sup>

These observations I have grouped in three tables, thus: Table I, in which only endo-cranial aneurisms of the vertebralis are considered. They number eleven cases. Table II embraces only the extra-cranial or cervical aneurisms. They number twenty cases. Table III is a collection of wounds or lesions of this artery, involving its surgical or extra-cranial portion. This embraces twenty-two reported cases.

We are at once forcibly struck by the great mortality of this class of injuries, for out of a total of fifty-three cases we find that forty-five died in direct consequence of the lesion of the vertebral artery or complicating circumstances associated with it.

We should at once eliminate the table of endo-cranial aneurisms, as these lesions were all, with one exception, of purely pathological interest, having resulted from degenerative changes in the endo-cranial arteries and appertaining to a domain entirely foreign to our present subject. We will only add that all these cases, without exception, ended fatally—100 per cent.

Of the twenty cervical aneurisms which are grouped in Table II six recovered, leaving a mortality of 70 per cent. for this class of injuries. These aneurisms were all traumatic, with the exception of Case No. 7, which was reported by Stubbs. In Table III, which exhibits the non-aneurismal injuries, twenty-two in number, we find that all but three were the result of traumatism, chiefly stab, punctured or gunshot wounds. We note that of these twenty-two cases only two recovered, leaving a mortality of 90 per cent. for the non-aneurismal traumatism. If we add

<sup>1</sup> I have references to several other cases, but they are so lacking in detail they are useless for purposes of study or tabulation.

the nineteen wounds of Table II, which gave rise to the nineteen traumatic aneurisms and the twenty-two non-aneurismal wounds of Table III, then we will have forty-one cases of wounds, with a total mortality of 80.69 per cent., and a percentage of recoveries equal to 19.31 per cent., which gives a more approximate idea of the general results of the traumatisms of this dangerous artery.

We notice that in all the tables the males have preponderated by a large majority.

As to age, we note also that while the endo-cranial or pathological lesions of the vertebral occurred in subjects averaging 39.10 years of age, the traumatic aneurisms presented themselves in patients averaging 22.10 years.

In considering the influence of the weapon with which the injury was inflicted, on the career of the case and the final mortality, we observe that fourteen out of twenty-four punctured or stab-wounds terminated in fourteen traumatic aneurisms, and that only four out of fourteen gunshot injuries terminated in aneurisms. One man who was gored by an ox (Pirogoff's case) died from an aneurism of the vertebral, resulting from the injury. Two deaths, which were caused by erosion of the vertebralis by tubercular abscesses, terminated without aneurismal formation, and another pathological erosion of the artery (Küster's case) terminated by cerebral and other complications, after the bleeding had been permanently controlled, without aneurismal formation.

This would seem to indicate that while the final mortality is practically the same for either class of injuries (stab and punctured, 79.16 per cent., and gunshot injuries, 78.14 per cent.), there appears to be greater prolongation of life after stab and punctured injuries than after those caused by firearms. This must be due to the multiple and more complicated character of the injuries caused by the last class of weapons, which often end the life of the patient too soon to allow of the provisional hæmostasis implied by an aneurismal formation.

If we now investigate the immediate causes of death in the forty-three tabulated cases of injury of the vertebralis, we will readily recognize five essential factors which, in the order of their frequency and importance, I would put down as follows: (1)

Hæmorrhage; (2) Shock; (3) Sepsis; (4) Exhaustion; (5) Cerebral complications.

Very rarely did one of these conditions alone cause death; almost as a rule, the fatal result was due to the association of two or more of these lethal elements.

In the majority of the cases hæmorrhage was the dominant factor; in some cases alone, but usually combined with one or all the other conditions. In at least 35 per cent. the hæmorrhage was not definitely controlled before the other complicating elements fatally closed the career of the cases. It is nevertheless an encouraging fact that in as many as twenty out of the forty-three tabulated wounds of the vertebral, or nearly one-half of the traumatisms, the physiological resources of nature, with very little external aid, were sufficient to control the primary bleeding from the artery and circumscribe it within the limits of an aneurismal cavity. It is probable, indeed, that in the simplest or least complicated types of this injury the *primary* hæmorrhage from the bleeding artery can be controlled by the natural methods of hæmostasis, if only aided by some comparatively simple external treatment—such, for instance, as superficial pressure over the wound applied digitally, by suturing the wound, or by bandaging or plugging it externally.

This is conclusively proved by the case reported by L. Stromeyer,<sup>1</sup> which is worthy of citation here:

A soldier was wounded in the neck in the battle of Idstedt, July 25, 1850. He was taken to Gottorp, near Schleswig, where Dr. Herman Schwartz extracted the ball, which could be distinctly felt in the nucha. News came that the battle had been lost, and to avoid capture the patient fled on foot eight miles to Kiel, where he died on July 29, four days after the injury, with meningeal symptoms.

At the autopsy it was found that the ball had penetrated the right cheek half an inch from the angle of the mouth, going inward in the direction of the posterior wall of the pharynx. It grazed the tongue, barely touched the internal carotid, and, after penetrating the posterior pharyngeal wall, fractured the transverse process of the

<sup>1</sup> Maximen der Kriegs Heilkunst, Hanover, 1861, pp. 443-553; also by Pirogoff in his Kriegs Chirurgie, 1864, p. 563.

first cervical vertebra, lacerating the vertebral artery at this point and lodging finally under the skin of the sub-occipital region.

The absence of hæmorrhage in this case is remarkable, and the explanations given by the findings in the autopsy by Prof. Webber, of Kiel, are worth noting. He says: "The wounded vertebral had not bled and was not likely to bleed. The two divided extremities had completely retracted, the upper end was cut on a level with the transverse process of the atlas, the lower end, much retracted, was filled with a resistant thrombus an inch and a half in length. There was no notable extravasation of blood in the vicinity; the upper end was likewise completely plugged with a thrombus."

It is true, nevertheless, that in the majority of the cases, or at least 50 per cent., the conditions of the wound, or rather its complications, are such that the natural hæmostatic process is entirely insufficient, even in a merely provisional sense, and that surgical assistance of the most determined and skilled sort must be immediately appealed to if danger to life from hæmorrhage *alone* is to be averted.

If we now analyze the table of twenty-two cases of wounds which did not become aneurismal, we will observe that in some the hæmorrhage was so sudden and profuse that death came on before any skilled assistance could be rendered; in others, and these were more numerous, the fatal hæmorrhage was never controlled, even when the patients were opportunely taken to hospitals or to competent surgeons.

As has already been stated, in over 44 per cent. of the injuries of the vertebral artery in which any surgical treatment was attempted, errors of diagnosis were almost invariably committed, so much so that in sixteen out of thirty-six cases the common carotid artery was ligated by mistake.

This error was always of very serious consequence, for it not only increased the shock by adding to the traumatism, but it aggravated the hæmorrhage by increasing the strain on the vertebral circulation, and, furthermore, greatly increased the risk of secondary cerebral complications.



It must be stated also that from the standpoint of hæmostasis alone the cases in which the injury to the artery has been inflicted through the mouth are of still greater gravity, especially if the bleeding is taking place in the pharynx, where it is almost impossible to control the bleeding orifice by plugging it or by other direct procedures. This is well shown by Case 2, Table III, reported by L. J. Sansom.<sup>1</sup>

In July, 1830, an adult male was admitted in the Hotel Dieu, of Paris, to be treated for a gunshot wound in the head and neck. The ball had penetrated by the right nostril, had fractured the palate, and was lost in the pharyngeal region. Slight bleeding had taken place from the nose and throat immediately after the injury, but it had stopped spontaneously. About the tenth day after the affair very abundant hæmorrhage took place. The course and track of the bullet did not lead the attendants to suspect a lesion of the vertebral. A wry neck had supervened, but it was attributable to independent causes. Preparation was made to ligate the carotid, but the patient died before the operation could be attempted. At the autopsy it was discovered that the ball had fractured the transverse processes of the upper cervical vertebra, and had injured the vertebral in its course.

The fatal cases reported by Voisin, Thurot, Kade and Peters emphasize the fact that the syncope and exhaustion of surgical anemia from frequently repeated and profuse hæmorrhages of the vertebralis, is to be regarded as of primary importance in influencing the mortality.

In all wounds of the vertebralis there is always a certain amount of shock, which varies in intensity with the extent, importance and multiplicity of the structure involved, and shares the responsibility, equally with hæmorrhage, in determining the final issue, or may even exceed it in importance.

This is especially true of the cases of injury of this artery in which death is practically instantaneous.

Types of this class are the cases reported by Jolly, of Clermont, France, Carter, of Bombay, and Saviotti, of Milan.

<sup>1</sup> Des Hæmorrhagies Traumatiques, Paris, J. B. Bailliere, 1836, p. 352, 8vo.

In Jolly's case (a wound in the neck caused by the penetration of a load of wadding from the discharge of a pistol loaded only with powder), death was instantaneous. The autopsy revealed that the transverse processes of the second and third cervical vertebræ had been torn away *en masse* and that the fourth had been fractured into fragments. The vertebral artery was completely torn away; a terrific hæmorrhage had taken place through the wound and the spinal meninges were exposed and covered with clot.

In Saviotti's case, a man aged thirty years was stabbed in the neck. He fell almost unconscious immediately, but shortly after the injury he picked himself up and succeeded in dragging himself up to the stairway of the Ospedale Maggiore of Milan, where he dropped dead as he attempted to ascend the stairs. In the autopsy it was discovered that the fatal wound had completely severed the vertebral artery in the inter-transverse space between the third and fourth vertebræ. An extensive extravasation about twelve centimetres in length filled up the retro-pharyngeal space and pressed important structures.

In Carter's case, a native Naique policeman, aged twenty-five years, was stabbed in several places by another policeman and died about one hour after sustaining his injuries. In this case the vertebral artery had been severed in the inter-transverse space between the third and fourth cervical vertebræ. Here the phrenic and other structures had been injured.

In another group of cases we find that while the patients have survived the primary hæmorrhage and shock, the repeated bleeding from the vertebral and a septic condition of wound, which is maintained by the manipulations and the various styptic and other applications that are made to the wound with a view of controlling the hæmorrhage, finally exhaust the vitality of the sufferer and cause death by the combined influences of anemia, shock and exhaustion.

The observations reported by Barbieri and Monti, Prichard and Pirogoff illustrate the characteristics of this group.

Another group is distinguished by *the* most fatal form of complication, viz.: a disturbance in the cerebral circulation and secondary encephalic lesions from septic causes—such as cerebral embolism, meningitis, softening, etc. Typical examples of this

group are: Stromeier's case, already cited, in which meningitis carried away the patient after the hæmorrhage from the wounded vertebral had been completely controlled, four days after the injury. Maisonneuve and Favrot's remarkable and now celebrated observation in which we notice that, after a most laborious and intrepid search, these operators ligated the vertebralis and arrested an obstinate hæmorrhage from a stab-wound of the neck,<sup>1</sup> only to lose the patient one month after the operation from septic cerebral embolism, due to infection of the wound. The case of Watson, in which the jugular and common carotid were ligated and the subclavian was compressed for a complicated vertebral hæmorrhage. The patient rallied after a most terrific ordeal and was apparently going to improve, when cerebral symptoms set in, and the patient died in coma, three days after the injury.

Still another group of cases may be separated from the others, in which the distinctive feature lies in the pathological origin of the injury to the vertebralis. In these cases the artery is eroded by perivascular suppurative foci, usually tubercular, sometimes septic, and always secondary to other traumatisms or diseases.

Typical of this group are the cases reported by Perrin, Neuretter, Van Buren and Küster. This is an essentially unfortunate group as far as the ultimate prognosis is concerned, for the vertebral injury is usually the last act of a long tragedy. The patients are generally exhausted by long-existing disease or extensive traumatisms to the cervical skeleton, and when the hæmorrhage comes there is little strength and vitality left in the patients to stand any further drafts on their blood supply or their nutrition. Küster's case is especially interesting in this group, not only as a type of the condition referred to, but also because it occurred in the practice of an eminent contemporary surgeon, who was able to cope with the difficulties in his way with the resources of modern surgery. His case is also one of the few in which the hæmorrhage from the bleeding vessel was

<sup>1</sup> In this case the vertebral was ligated *in situ* for the first time in the history of surgery.

permanently controlled, and although the patient finally died from cerebral disturbance, the method pursued in controlling the bleeding artery is worthy of remembrance in the treatment of similar cases.

*Observation.*—A dyspeptic female, aged thirty-five years, very marasmic and addicted to morphine, developed a tubercular abscess of the neck, on a level with the fourth cervical vertebra. The patient's condition was so unfavorable that Küster declined to open the abscess. As the abscess threatened to burst spontaneously and hectic began to manifest itself, he decided to open it. After extirpating the walls of the sac, he discovered a sinus which could be traced to one of the transverse processes and which had to be dilated with a dressing forceps. This allowed the finger to detect the exposed portion of the second cervical vertebra, which was loose and necrosed. The sequestrum was pulled out with forceps, but at that instant a stream of arterial blood poured out of the wound, which was quickly stopped by the immediate reintroduction of the finger into the sinus. After a short delay the finger was partially removed and the blood again poured out. It was now evident that the arteria vertebralis had been injured. As the strength of the patient did not allow of any loss of blood, no further experiments were tried with the finger, but in its stead a tampon of iodoform gauze was introduced and insinuated until it was firmly packed in the corresponding inter-transverse space. The hæmorrhage then stopped at once and never returned. A compressing bandage around the head and neck added to the secure retention of the plug. The tampon was allowed to remain *ten* days. When removed it had a distinct odor of iodoform and the wound was entirely free from inflammatory reaction. In the meantime diverse disagreeable symptoms had developed, which were at first attributed to iodoform poisoning. On account of this sublimate gauze was substituted for the iodoform, temporary improvement followed, but vomiting and cerebral symptoms ensued, which terminated by the sudden death of the patient nineteen days after the operation. The autopsy revealed an aseptic wound in the neck and complete laceration of the vertebralis in the transverse process of the axis, but both ends of the divided artery were effectually closed with a strongly adherent thrombus, showing very advanced organization, the lower of which extended three centimetres

and the upper extended to the level of the foramen transversum of the atlas.

Setting aside the explanation of the manner of death which, as the author says, might not be quite simple, we learn from this observation that an iodoform tampon can effectually and permanently arrest a hæmorrhage from an artery of the caliber of the vertebralis, and remain in place for *ten* days without calling forth local disturbances. This is the essential feature of the modern antiseptic tampon, as contrasted with the plug used by the older operators, who not only used materials that were far from being aseptic, but actually saturated this material with styptic agents which irritated the wound and favored the development of septic suppuration, thus interfering with the proper organization of the clot.

The great value of the tampon, especially the aseptic or antiseptic tampon; systematically applied in the very depths of the wound and directly against the bleeding point in the arterio-vertebral canals, in permanently arresting vertebral hæmorrhage, is not only demonstrated by Küster's case, but is still more strikingly emphasized by the fact that in the only two cases of primary vertebral hæmorrhage that recovered, out of the twenty-two collected cases, the only agent employed was a tampon. In J. Mason Warren's case ordinary sponges were first used and subsequently sponges dipped in styptic solutions, and in King's case oiled lint and graduated carbolized compresses were used; if we add, that three of the six traumatic aneurisms (see Table III) that recovered, were also saved by systematic plugging of the bleeding orifice, making in all five out of the eight permanent recoveries in the whole collection of forty-three injuries that are due to plugging, we will appreciate still more forcibly the value of the tampon as a hemostatic agent. We shall again refer to this invaluable aid in the treatment of vertebral hæmorrhages when we reach our practical conclusions.

We must now hasten to the consideration of the traumatic aneurisms of the vertebral artery, which we have separated in a distinct group of twenty cases for special consideration.

## IV.—TRAUMATIC ANEURISMS OF THE VERTEBRALIS.

While a traumatic aneurism of the vertebral artery is only a sequel to the primitive injury that originated it, the clinical difference between a primary bleeding wound of this artery and the false aneurism that may follow it, is of sufficient practical importance in the treatment to justify a separate consideration of the two conditions.

While a traumatic aneurism may develop so promptly after an injury, and the extravasated blood may diffuse itself so rapidly and widely that immediate surgical action may be demanded for the salvation of the patient, it is the rule that the concealed and progressive hæmorrhage which causes the aneurismal state, is so well circumscribed by the resistant perivascular tissues, that a temporary respite is given to the patient, and more time is gained by the surgeon for deliberation and the application of conservative measures of treatment. It is by this delay, which gives time for preparation, that the prognosis is improved and the ultimate chances of recovery are increased in traumatic aneurism.

If we now inquire into the facts of clinical experience, we will again observe that while the prognosis of traumatic aneurism is always very grave, that the number of recoveries is greater than in the primary bleeding injuries of this artery; for, in a tabulated record of twenty reported cases of traumatic aneurism, six patients recovered, or 30 per cent., while in a collection of twenty-two primary non-aneurismal injuries, only two recovered, or 9.2 per cent., which would result in a difference of 20.+ per cent. in favor of the traumatic aneurisms.

We have already stated that in a collection of thirty-one reported cases of aneurism of the vertebral artery gathered up to 1893, twenty were cervical and eleven intra-cranial. We need not again refer to the intra-cranial for the reasons previously given, but referring to the twenty cervical aneurisms we will observe that fourteen were caused by punctured wounds, four by gunshot injuries and two were not specified. In eleven out of twenty cervical aneurisms of the vertebral, the common carotid artery was ligated by mistake, and in a large majority the initial curative efforts were directed toward the control of the carotid



circulation. Finally, of these twenty cervical aneurisms only six recovered.

These six successful cases are most instructive and interesting from the standpoint of surgical therapeutics, and deserve individual mention. Chronologically we will consider them as follows:

OBSERVATION NO. I. BY MÖBUS.<sup>1</sup>

On December 27, 1827, the author was called to attend a man, aged twenty-three, who had been stabbed in the neck, and who was apparently dying from hæmorrhage. The patient was almost pulseless and bathed in a profuse icy perspiration. The wound had ceased to bleed spontaneously when M. arrived. The wound was situated in the inferior right half of the occipital region, and was directed downward and forward in the direction of the mastoid. It measured two inches and three lines in depth. A firm plug or compress was packed into the depths of the wound, and the plug held in place by a firm bandage. Ether, opium and cinchona were administered to restore the patient.

The patient improved steadily until the fifteenth day, when secondary hæmorrhage took place from the wound, which had not yet completely healed, but this was arrested by firm pressure. On the seventeenth day a pulsating tumor the size of a bean was detected at the wound; an alum solution was directly applied to bottom of the it with the help of a firm compress, and bandaged. On the twenty-seventh day the tumor was very much larger in spite of local astringent applications and ice poultices, which were now applied for the first time. The tumor soon measured five and one-quarter by four and three-quarter inches in size. The diagnosis of vertebral aneurism was made after testing the effect of pressure on the carotid circulation. An operation was proposed, but patient would not consent to it. Ice poultices were now constantly applied, while the patient was kept in bed. On July 26, or about fifty-nine days after the injury, the tumor became perceptibly harder, and the pulsations diminished. Improvement rapidly followed, and by March 6 the patient was entirely well.

This case, therefore, demonstrates that a traumatic vertebral aneurism may be completely controlled by *cold, direct pressure*,

<sup>1</sup> Graefe's and Walther's Journal, Vol. XIV, p. 98.

*and general as well as local rest*, which were the only therapeutic agents resorted to by the medical attendant.

OBSERVATION NO. 2. WARREN STONE,<sup>1</sup> New Orleans, La.

A negro slave, aged thirty years, was brought to Stone's Infirmary *five months* after he had been stabbed in the left side of the neck. He bled profusely at the time of the affray, but the hæmorrhage was arrested. A swelling commenced soon after, which gradually increased "until the integuments were about to give way." A careful examination showed that the carotid artery and jugular vein were not wounded. Auscultation gave no sign, and Stone came to the conclusion "that either the external jugular vein or one of the cervical arteries had been wounded." He says: "I concluded to open the tumor, empty the sac, and secure whatever had been wounded. The opening was made, when a small portion of the coagulum was discharged and a sudden gush of arterial blood took place. I placed my thumb upon the carotid artery, but with no effect; the incision was enlarged, the whole coagulum was forced out, and it was found that the vertebral artery had been wounded. For a moment a finger was thrust between the transverse processes, by which means the violence of the bleeding was controlled. Lint was stuffed in place, granulations shot out luxuriantly, filled up the wound and plugged up the wounded artery." The patient was shortly after discharged, entirely well, from the hospital.

This is the first recorded case in which operative interference in a traumatic aneurism of the vertebralis was followed by recovery.

OBSERVATION NO. 3. Reported by TH. KOCHER,<sup>2</sup> Berne.

A. S., aged forty-two, was wounded three weeks before admission to Kocher's clinic. He had been stabbed four times in different parts of the body, a wound in the neck being considered the only serious one of the four. Examination revealed a wound between the fifth and sixth cervical vertebræ to the left of the spinal column. The wound had not healed kindly, and it was for this reason that the patient consulted Kocher. Upon raising the scab that covered the

<sup>1</sup> New Orleans Medical and Surgical Journal, Vol 1, p. 555, 1849.

<sup>2</sup> Ueber Verletzung und Aneuryma der arteria vertebralis, nebst mittheilung eines glücklich verlaufen. Falles, Archiv. f. Klin. Chirurg., Berlin, 1871, Vol. XII. p. 867.

granulations, the wound bled. The introduction of the finger excited a more considerable arterial hæmorrhage. The index finger was re-introduced its whole length into the wound, and easily penetrated through a semi-solid mass of coagula until it touched the posterior surface of the transverse process. As the finger failed to arrest the hæmorrhage, the wound was enlarged three inches, and a quantity of coagulated blood was expelled. The exploring finger now discovered a spacious cavity, the size of a small apple, in the deeper parts of which the transverse processes of the vertebræ could be felt. After enlarging the wound the interior of the cavity could be easily inspected. It was then discovered that the bleeding came from the inter-transverse space between the fifth and sixth transverse processes of the cervical vertebræ. A strong arterial stream from the lower, and another of equal size from the upper foramen in the transverse process poured out of the wound. Pressure applied to either orifice controlled the bleeding. A ligature could not be applied to the divided artery because of its retraction to the level of the vertebral orifices, and there was nothing to hold the thread. For this reason a round charpie plug, the size of a pea, which had been previously dipped in a perchloride of iron solution, was introduced into the upper and lower vertebral arterio-transverse orifices and tightly packed into the osseous canals. Hæmorrhage was immediately and perfectly arrested. A firm compress was applied, and the head was immobilized with a stiffened cravat to secure absolute rest to the wound. The plugs were removed four days after their introduction, and no hæmorrhage followed.

Erysipelas set in, however, but it was subdued with turpentine, and the patient finally completely recovered and was discharged about five weeks after admission.

OBSERVATION No. 4. Reported by CHRISTIAN FENGER, Chicago. G. C., a male cook, aged nineteen, robust and well nourished. Had always enjoyed good health until January 6, 1881, when, while intoxicated, he was shot in the neck with a 32-calibre revolver. A large stream of blood spouted from the wound, and in fifteen minutes his face, around the lower jaw, became so swollen that he was unable to open his jaws for more than half an inch. On admission to the Cook County Hospital an external bullet wound was found to exist an inch external to the left of the posterior nuchal median line, on

<sup>1</sup> Medical Standard, Chicago, March, 1887, Vol. I, No. 2.

a line with, and two inches behind, the mastoid. There was great swelling of the corresponding side of the face and neck, showing great interstitial effusion of blood. Five days after admission, while straining at stool, the patient felt something give way behind the angle of the jaw. This was followed by intensely agonizing pain, accompanied by decided pulsation in the left sub-auricular region. Four days later a decided aneurismal *bruit* was detected over this. As there could be no doubt of the existence of a traumatic aneurism at this point, Dr. E. W. Lee ligated the left common carotid artery. The patient felt well with the exception of a slight headache and slight sensation of pulsation below the left mastoid process. No aneurismal bruit was detectable on stethoscopic examination.

Three days subsequently, while undergoing cross-examination in court, the sensation of pulsation increased, and, on return to the hospital, a decided thrill, but no bruit, could be detected behind and below the left mastoid process. "By February 9, the pain and pulsations had markedly increased. As it was obvious that a traumatic aneurism had recurred and was endangering life, I decided to make the radical operation, and began by securing the external carotid. An incision was made, three inches in length, along the entire upper half of the sterno-mastoid, the tissues were carefully separated, a careful watch kept for the pulsating vessels around the border of the pulsating tumor, with a view of ligating them before opening the aneurismal sac. When pulsation on pressure, in various places, had been apparently felt, and the aneurismal pulsation seemed to cease, an aneurism needle, armed with heavy aseptic silk, was passed successively around the area of the tissues involved, and ligature applied *en masse*, but in vain.

I then determined to lay open the sac and catch up the supplying artery *in loco*. A transverse incision, two and a half inches in length, was made, extending from the upper end of the former incision backward from the mastoid process through the skin and insertion of the sterno-cleido-mastoid, in order to secure the posterior occipital artery, possibly the source of the aneurism. On removal of the sterno-cleido-mastoid, the pulsations were more markedly felt. After a thin layer of the deep nuchal muscles had been cut through, the aneurismal sac was opened and found filled with dark clots, on removal of which arterial blood spurted out. This hæmorrhage could be controlled only by pressure on the bottom of the cavity at its deepest part. The squama ossis occipitis was found denuded, and in

the internal wall, formed by the atlas and axis, some splinters of bone were felt. The tissues were cut through downward along the transverse processes of three or four cervical vertebræ and the whole sac laid open, which necessitated the removal of the upper fourth of the sterno-mastoid muscle. Artificial respiration and injections of whiskey were required at this stage, as respiration had ceased. When the respirations again began search was made for the vertebral artery, which was finally taken up, at its curvature around the axis, and ligated. The bleeding stopped. The vertebral artery was nearly as large as the internal carotid. During ligation the respirations had stopped, and the patient was pulseless and seemed dead. After dressing the wounds, eight ounces of defibrinated blood were transfused. The patient rallied rapidly, and on April 7 left the hospital entirely well.<sup>1</sup>

OBSERVATION No. 5. REPORTED BY DR. ROBERT F. WEIR.<sup>2</sup>

"On December 8, 1883, a man named Robert Adams, aged twenty-eight, was brought into my ward at the New York Hospital, having received a short time previously a stab-wound in the right side of the neck, from a knife held in the left hand of his opponent, who faced him when striking at him. The patient said he had bled very freely, but his clothes were not much stained with blood, nor was he weakened or exsanguinated. When first seen by the house surgeon, no farther bleeding was taking place from the wound, which was situated about three-quarters of an inch below the lobe of the right ear, and just anterior to the sterno-cleido mastoid muscle, transverse in direction and about half an inch in length. There was below this point and extending several inches downward an ovoid,

<sup>1</sup> This is the first and only case in which the vertebral artery has been ligated *in situ* with *permanent* success in a case of traumatism or traumatic aneurism of this artery. Maisonneuve and Favrot, in 1852, were the first to ligate the artery *in situ* in a case of gunshot injury of the vertebralis, but the patient died seventeen days after the ligation of the artery of septic embolism. These are the only two recorded cases in which a ligature has been applied to an injured vertebral artery. Attempts have been made to ligate this vessel *in situ* in several cases mentioned elsewhere, but the local conditions and urgency of the symptoms compelled the operators to resort to immediate plugging or some other measure to arrest the bleeding. Fenger is in error when he says (*loc. cit.*) that his is the fifth case "in which vertebral artery ligation for a wound involving a traumatic aneurism of the vertebral artery has resulted in recovery." His was the second case of *ligation*, the others were simply illustrations of effectual plugging.

<sup>2</sup> Archives of Medicine, Vol. XI, No. 1, February, 1884.

soft, non-pulsating tumor, running and posterior to the mastoid muscle. All exploration of the wound was avoided and an iodoform dressing applied and secured by a compress and firm bandage.

December 10.—Tumor has almost entirely subsided; wound nearly healed; patient yesterday afternoon suddenly experienced almost complete paralysis of sensation and motion of the left arm and hand; this was preceded by a "queer" confused, not painful feeling in his head, momentary in duration; consciousness not lost.

December 15.—Tumor has disappeared; wound entirely healed; paralysis is slowly disappearing; at a point two inches below and one inch posterior to lobe of right ear palpation discovers a faint pulsation slightly expansive in character, and on auscultation a slight bruit is audible.

December 25.—Since the last record all the signs of aneurism have developed at the point indicated in last note; pressure on the carotid just below the level of thyroid cartilage does not affect the pulsation in the tumor, but pressure over the tubercle of sixth cervical vertebra controls it at once, nor does it react as long as the compression is continued. Ice-bags and pressure were ordered to be applied alternately every three hours over the tumor.

January 1.—The signs of aneurism, including pulsation, thrill, tumor and bruit, are still more pronounced; no appreciable effect has followed the treatment by ice and pressure; the area of pulsation is now nearly two and a half inches in diameter; the paralysis of the left arm is becoming less marked.

January 3.—To-day digital pressure was resorted to at the lower anterior edge of the aneurism, where yesterday it was found that compression arrested all pulsation; this was continued for seven hours by the house staff, assisted by relays of students; considerable force was necessary at first to control the circulation in the sac, which occasioned some pain and discomfort, and required morphia, gr.  $\frac{1}{3}$ , hypodermically to keep the patient quiet; no cerebral symptoms occurred at any time during pressure; after two hours there was great diminution in force of pulsation, and slight pressure controlled it without further discomfort to the patient; after three hours the pulsation could not be felt and all signs of the aneurism, save the resistance due to the tumor on palpation, had disappeared; pressure was continued lightly until 7 P. M. (in all seven hours), at which time a firm graduated compress was applied; no cerebral symptoms were noticed during the treatment; no return of symptoms; a solid



tumor can be appreciated at site of aneurism; paralysis of arm has almost completely disappeared; general condition excellent.

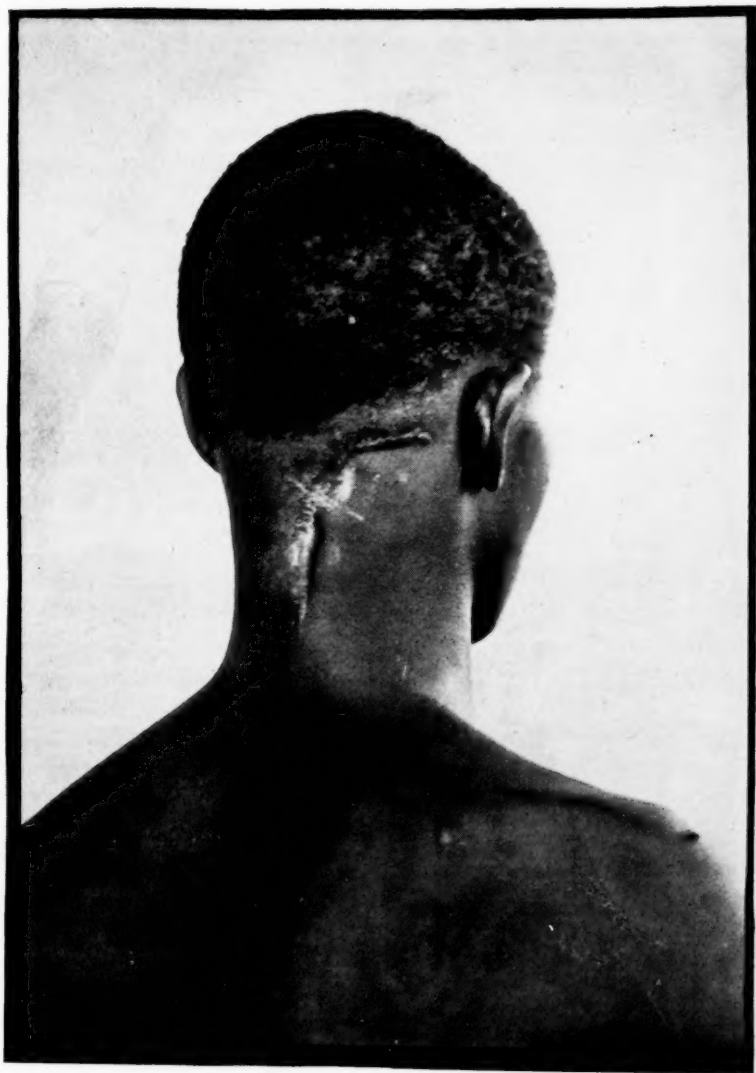
January 12.—Since last note patient has been up and about; no return of sign of aneurism; only a slight trace of the swelling can now be felt; the patient was to-day discharged from the hospital as cured.

This case so happily terminated by a bloodless procedure is especially interesting on account, not only of the variety of the mode of termination, but also because of the method employed, which is unique in the record of this class of arterial injuries.

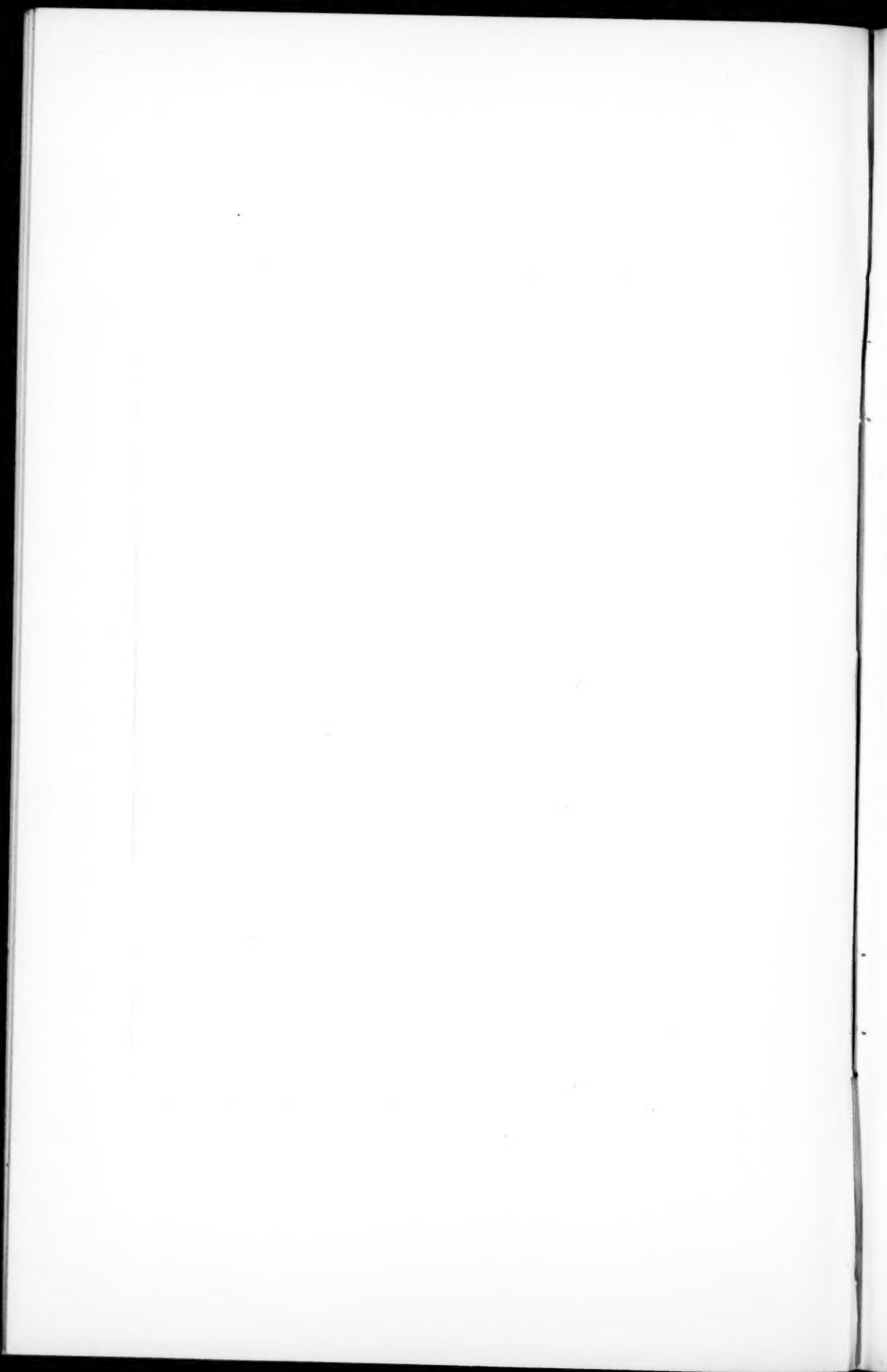
OBSERVATION NO. 6. BY THE AUTHOR.

*Traumatic Aneurism of Right Vertebral Artery Occupying the Sub-occipital Triangle Caused by Gunshot Injury and Involving the Artery in the Atlo-axoid Space. Incision; Extirpation of Sac; Plugging of Bleeding Point; Recovery*—The patient, Vance J., is a bright mulatto youth, aged twenty-one, a native of Louisiana, admitted to Ward No. 2, Charity Hospital, July 6, 1888. He states that about two months before admission he was accidentally shot in the back of the neck by another person who stood about seven feet away from him, the injury being inflicted by a revolver (Smith & Wesson) which carried a forty-four calibre bullet. He says that immediately after being shot he became paralyzed in his right arm and leg and also became quite numb in the corresponding side. His arm and leg was almost "lifeless," but about ten days after the accident he began to recover some control of his arm and hand and has been steadily improving since, so much so that now he can "use" his limbs almost as well as before the injury. He furthermore states that he bled very profusely from the bullet wound at the time of the injury and that he has bled more or less freely from it ever since. The orifice made by the bullet has apparently healed at various times, but it "broke" open again as often and bled each time profusely, so much so that he was so weak that he could only with great difficulty sustain the fatigue incident upon his travel to the hospital. These repeated hæmorrhages alarmed him more than all his other symptoms and have caused him to seek the assistance of the hospital surgeons.

*Status Præsens*.—The patient is anæmic and his pulse is weak and compressible, it averages 100; temperature 99°. He was immediately put to bed and examined. A prominent pulsating tumor was



MATAS—Line of scar resulting from the incision in case of Traumatic  
Aneurism of the Vertebral Artery.



at once recognized in the upper post-cervical region. The swelling is diffused in the right sub-occipital space extending from the posterior border of the sterno-mastoid in front to the median line posteriorly. It reaches the inferior occipital curved line above and descends to the level of the fourth cervical vertebra below. A perforation, in the centre of a circular bluish cicatrical spot, indicates the aperture of entrance. This opening is situated three inches below the external occipital protuberance and one and a half inches to the *right* of the same point and about three inches in a horizontal line behind the mastoid process. These measurements were taken with the head midway between flexion and extension. The pulsations of the tumor, which is diffusely spheroidal, are visible to the eye at a considerable distance and are associated with a moderate thrill on firm pressure. The swelling is reducible under firm pressure, though the pulsations are so strong that a four-pound weight is easily lifted up and down synchronously with them. A very low *quasi*-placental bruit is heard over the tumor under stethoscopic examination. Firm pressure over the common carotid at Chassaignac's carotid tubercle (sixth cervical transverse process), sufficient to arrest all temporal pulsation, exercises no influence on the pulsations. Even very hard pressure below this point, with the view of controlling the vertebral, has little effect in arresting the aneurismal pulsation. Simple compression of the carotid above the tubercle of the sixth cervical vertebra had no effect in arresting the pulsations of the tumor. Rouge's method of compressing the common carotid by pinching the sheath between the thumb and index through the relaxed sterno-mastoid succeeded in arresting temporal pulsation, but had *no effect* on the aneurism. In view of this unequivocal evidence it was plain that the tumor was not connected with the carotid and that consequently it must be a traumatic aneurism of the upper vertebral artery (probably diffused), involving this artery shortly before its entrance into the cranium. My colleagues in the surgical service, Drs. Miles, Parham, Laplace, Chassaignac and Michinard, who saw the case with me likewise concurred in this opinion.

*Treatment.*—The patient was at once put to bed and given the benefit of complete rest. He was informed of the nature of his condition in order that the necessity for complete repose, especially of his neck and head, be more thoroughly impressed upon him. An ice-bag was applied over the swelling.

On July 9, a three-pound weight, wrapped up in cotton and

gauze, was applied directly over the tumor and held *in situ* with an elastic (Martin's) bandage wound around the forehead.

July 10.—Patient complained that the pressure of the elastic bandage was intolerable and that he could not stand it longer. The tumor pulsed almost as vigorously as ever apparently unaffected. The elastic was removed and an ordinary roller gauze bandage substituted to hold the weight which was replaced over the swelling.

July 11.—Patient can only stand the weight intermittingly; compelled to relieve him of the solid weight altogether, and substitute a bag of bird shot (No. 6) weighing five pounds, which is adapted much better to the contour of the swelling and causes less complaint. This weight the patient can stand, without the addition of retaining bandage, for one or two hours at a time, when he removes it and rests for half an hour or more. In the intervals of rest the ice-bag is applied.

Thus far very little impression has been made upon the swelling. At times I fancy the pulsation is less vigorous. The dimensions and appearance of the swelling have certainly been unaffected. Patient complains of greater soreness and is growing tired of treatment.

July 13.—Two long electrolytic needles are connected with the negative pole of a McIntosh eighteen-celled galvanic battery. The current furnished by twelve cells was applied; the needles were introduced as deeply as possible in the softest parts of the tumor. This application lasted about an hour without any very perceptible result when the needles were withdrawn. Ice-bag and weight were continued intermittingly.

July 20.—A marked change has taken place in the tumor since yesterday. The wound of entrance which, since the application of the shot weight had closed cicatricially, is now swollen and projects upward as a distinct conoidal swelling rising about one inch above the level of the tumor. Just in the centre of this elevation, at the point corresponding to newly-formed cicatrix, the skin is purplish and threatens to tear open at the least provocation. The tumor proper appears to be more diffused and pulsates vigorously, though not with so strong an impulse as on the day of admission. On the other hand the pulsating area appears to have been extended over a larger surface, so that it is now very close to the external occipital protuberance, and is advancing over the median line in spite of the natural barriers to further progress in this direction. The general appearance of the swelling indicates that it is ready to burst through

the original wound, and in view also of the increasing restlessness and impatience of the sufferer it is plain that operative interference cannot be deferred much longer. The direct compression of the tumor is now abandoned altogether, and I decided to run the risk of opening the sac with deliberation and thorough preparation rather than expose the patient to the great danger of accidental rupture without the benefit of immediate assistance. After preparing a considerable quantity of iodoform gauze and other antiseptic material that might be required in permanently packing the wound, I decided to immediately cut into the newly-formed nipple-like swelling and then through it make a digital exploration of the interior. This acuminate point was, therefore, punctured; an opening, large enough to insinuate the index finger into the tumor, was made. A jet of dark sero-sanguinolent fluid shot out of the opening the moment the incision was made, and the pointed or nipple-like swelling collapsed. Before the index finger could be well introduced into the opening, the flow of the bloody fluid had entirely ceased, and it was evident, much to our surprise, that there was going to be no immediate hæmorrhage. The cavity of the aneurism *proper* had evidently not been opened, and the "tit"-like swelling communicated only with an encysted bloody accumulation which had been emptied by the first incision. The tumor, however, continued to pulsate, showing that the aneurism proper existed, but not as actively as before. I now proceeded to avail myself of the wound just made to explore the aneurism proper and to familiarize myself with its topography. I found that the newly enlarged wound of entrance led into a sinus that freely admitted the left index. The exploring finger could also be swept over and around a smooth, spheroidal, pulsating and well-defined tumor, apparently about two inches in diameter. The tumor appeared to be distinctly separated from the surrounding parts at its periphery, and gave the impression that it was a tense globiform sac. The free portion of the tumor appeared to be directed toward the suboccipital triangle, but it doubtless originated in the inter-transverse atlo-axoid space. Toward the mesial line it reached the ligamentum nuchæ, and upward it distinctly reached the inferior curved line which had been exposed by the dissection of the tumor. Further down, deeper than this, the finger could not explore without risk of injuring the sac. I was pleased to notice that, after the withdrawal of the exploring finger, no hæmorrhage followed, showing that my fear of immediate rupture had been unfounded. Dr. La-



place was also able to confirm these topographical data by a cautious repetition of my exploration.

By this operation we had obtained several important data :

(1) The aneurism was not diffused, but distinctly circumscribed and was contracting.

(2) Its topographical relation to the vertebræ and probable origin between vertebral transverse processes had been very approximately obtained.

After consultation I decided to go no further, but to avail myself of the newly-made opening to directly compress the aneurismal sac by carefully and systematically packing the sinus that led to it with iodoform gauze and then apply a firm compress and external retaining dressing. By this means I hoped to obtain a complete solidification of the contents or, in the event of failure to obtain this, to still further circumscribe the sac so as to enable me to reach the wounded artery more readily when attempting a radical operation at a later moment.

July 21.—The patient was quiet and comparatively comfortable ; the dressings were clean ; no hæmorrhage. The packing had evidently served its purpose well. I decided not to delay further action. The packing could not permanently remain in the wound, and, as it had to be removed at some early time, it was best to make a systematic and well prepared attempt to secure the wounded vessel outside of the sac by exposing the transverse processes of the vertebræ above and below the sac and ligating it in the inter-transverse space in the manner suggested by Gherini and Dietrich ; or, in the event of failure to do this, to simply lay the sac open, following Syme's modification of the operation of Antyllus, then seek the bleeding orifices and plug them in the vertebral canals, as had been done successfully before by Lücke and Kocher in two similar cases. I was encouraged to believe in the feasibility of the first plan, viz., the ligation in the inter-transverse spaces, because I had reason to suppose that the firm packing against the sac which had been maintained during the preceding twenty-four hours would have some effect in shrinking the tumor and probably solidifying it, thus permitting an unobstructed exposure of the transverse processes of the vertebræ and a comparatively easy dissection of the artery. I, furthermore, prepared to follow or expose the artery in case of need in the vertebral canals themselves by chiseling or biting off the transverse processes with rongeur forceps which form the walls.

of the canal containing the artery, immediately above or below the sac. With this plan in mind the patient was brought to the amphitheatre, where with the able assistance of several members of the staff, the operation was undertaken. After the removal of the dressings, excepting the plugs in the wound, the parts were subjected to the usual antiseptic preparation and the patient anæsthetized and the wound of entrance at once enlarged by a longitudinal deeply-made incision through the integument to the level of the sac downward and parallel with the spine, about four inches in length, and then upward to the external occipital protuberance. When this incision was completed the globular surface of the aneurism could be distinctly seen as it projected upward, apparently partially released from the cramped confinement in which it had been held by the strong muscles (trapezius, splenius and complexus) which covered it. The exposure of the tumor was now helped by an additional transverse incision, which starting nearly at right angles from the vertical incision extended outward through the thickness of the posterior cervical muscles to the mastoid, terminating on a level with the posterior origin of the sterno-mastoid. This incision involved the occipital artery, which began to bleed profusely, but was promptly clamped and gave no further trouble. By these two incisions a thick and triangular musculo-cutaneous flap was obtained which when reflected downward, permitted a very clear view of the tumor which, at this juncture, was seen pulsating, though very feebly as compared with its vigorous movements on previous days. This proved that the direct pressure, exercised by the packing, had been quite effectual in consolidating it. The exploring index, introduced at this moment in the depths of the wound, very readily circumscribed the tumor which appeared to spring up from the space between the atlas and axis, the transverse processes being readily recognized. While engaged in this exploration, preparatory to the denudation of the transverse processes in question, I noticed that the tumor apparently gave way, became partially collapsed and was without any assistance bodily lifted out of its nest; at the same time a profuse gush of arterial blood flooded the wound, and no doubt a very alarming hæmorrhage would have occurred had I not seized a handful of very small aseptic sponges that had been held in readiness for the occasion and immediately and tightly packed them in the bottom of the wound, in the inter-transverse space and *into the orifices of the canal* from which the hæmorrhage appeared to come. Over these small sterilized sponges

a thick packing of iodoform gauze was applied and the flap was held with two deep silver sutures over the packing, thus giving firm support to it. A careful sublimate dressing was applied externally and the whole firmly held in place by an elastic woven bandage wound over the forehead and neck. No further attempt was made to seek the artery, because the patient, who was already anæmic from previous losses, could ill afford to stand more hæmorrhage. At any rate the sequel happily proved that further search was unnecessary and that in this case, as in those of Lücke and Kocher, Stone, Warren and Küster, King and Simes, careful plugging was all that was really necessary to permanently relieve the condition. About five hours after the patient had been brought to bed the elastic bandage was removed and a gauze roller bandage substituted. The patient continued to do well.

On July 26, five days after the operation, the dressings and tampon were removed. The wound looked perfectly clean; no pus visible. Only three of the six small sponges were removed; the remaining three were left as grafts in the inter-transverse space, and were soon entirely amalgamated with the rapidly-growing granulations.

Eleven days after the wound was entirely healed, and on August 24, 1888, the patient was discharged entirely well.

About eleven months afterward the patient returned to the hospital with his wound entirely cicatrized and entirely free from any aneurismal lesion, but he stated that a few weeks after leaving the hospital (after the preceding operation) the scar, corresponding to the lower end of wound had "festered," and that a physician whom he had consulted had discovered the ball that had caused all the trouble and had extracted it. The ball had evidently grazed and possibly fractured one of the vertebral transverse processes and given rise to traumatic caries. At any rate the patient was now well and entirely rid of his aneurism.

The aneurismal sac, which was removed *in toto* at the time of the operation, presented the appearance of a spheroidal sac measuring about two and a half inches in diameter. It was very firm in all its surface except that portion which was evidently connected with the artery; here the walls were very thin. The sac walls consisted almost entirely of very compact and finely laminated active clot; the interior was partially filled with soft, dark, grumous passive clot; a considerable mass of clot blocked that portion which has been

attached to the artery. These clots were of very recent formation, and I do not doubt *proved the efficacy of systematic compression*. The sac had shriveled considerably, and surely did not represent when removed the full dimensions of its active period. The specimen was kept for a long time in the Pathological Museum of the Hospital, but about a year ago, owing to some misunderstanding, was thrown away together with a lot of spoiled specimens.

In the fourteen fatal traumatic aneurisms the immediate cause of death may be summed up, as in the case of the non-aneurismal wounds of the vertebralis, viz.: (1) Hæmorrhage; (2) Shock; (3) Sepsis; (4) Exhaustion; (5) Cerebral complications. The cases are worthy of individual mention:

(1) CHIARI, 1829. The common carotid was ligated without effect; patient succumbed with cerebral and septic symptoms.

(2) Prof. CATTOLICA, of Naples, 1861. The common carotid was ligated; six days after, the aneurism burst spontaneously, and the patient died of hæmorrhage before assistance could reach him.

(3) Prof. CATTOLICA, also 1861. Exposed the course of the common carotid, but before closing the ligature tested the effect of temporary compression of the artery. As this did not arrest the pulsation of the tumor, the ligation of the artery was abandoned, and the incision was allowed to heal *per primam*. Two months after this attempt the patient succumbed to "gastric fever," with his aneurism pulsating (?) and unruptured.

(4) Prof. NUNZIANTE, 1838? Cold; compression; aneurism ulcerates and patient dies of uncontrolled hæmorrhage.

(5) GHERINI, 1861. Cold; compression; perchlorid of iron injections; ligation of common carotid by Monti; then plugging of wound. Thirty-six hours after ligation of common carotid patient succumbed to syncope from hæmorrhage and exhaustion.

(6) RAMAGLIA, 1834. Common carotid was exposed and ligature applied but not tightened when it was discovered that its compression had no effect on aneurism. This patient died finally from uncontrolled hæmorrhage.

(7) KLUYSKENS, 1848. Digital compression of common carotid totally arrested pulsation in tumor. The common carotid was, therefore, ligated, but after ligation the tumor continued to pulsate as vigorously as ever. Shortly after, the aneurism burst, and the patient died of hæmorrhage.

(8) A. BRANCO, 1862. Pulsation diminished markedly by compression of common carotid; this trunk was ligated, but ineffectually as regards tumor which grew much more rapidly. Patient died of exhaustion.

(9) A. LÜCKE, 1867. Carotid compression diminishes pulsation in tumor. This trunk was, therefore, ligated, but without benefit; on the contrary, marked aggravation. As the tumor threatened to rupture, injection of five drops of the iron perchlorid made into the sac in different places; slight sloughing of the skin took place and copious hæmorrhage followed, and the method of Antyllus had to be appealed to. A free incision into the sac was followed by "a frightful gush of blood," which nearly carried the patient's life away, but was controlled by a styptic plug insinuated between the occipital and atlas. The patient recovered from the immediate effect of the operation to die shortly after from cerebral complications which were in a great measure attributable to injection and the ligation of the common carotid.

(10) STROPPIA, 1866. A hæmatoma connected with the vertebral artery is incised; plugging arrests hæmorrhage, but patient succumbs to repeated secondary bleedings.

(11) SOUTH, 1847. The common carotid is ligated under mistaken diagnosis; tumor rapidly enlarges and bursts into trachea.

(12) SIMES, 1888. This is a most interesting case and forcibly illustrates all the dangers and diagnostic difficulties that are liable to be thrown upon the surgeon while attempting to deal with the injuries which involve the vertebral. "Pressure upon the common carotid, while lessening the pulsation of the tumor, did not, however, perfectly stop it. Before tying the ligature, which had been passed around the carotid artery, the operator continued his incision upward over the swelling and threw a ligature round the artery above it. The ligature below was now tied, and instantly the most terrific flow of blood gushed out of the wound. The upper ligature was immediately tied, but had no control over the hæmorrhages; artery forceps and fingers were employed to seize any and all the bleeding points, but the blood continued to flow until finally Dr. Nancrede thrust his finger deep into the wound against the vertebræ, when the hæmorrhage at once stopped. Attempts to plug the vertebral foramen with a cork plug failed, but the hæmorrhage was finally controlled by packing the canal with a long strip of lint reinforced by systematic packing of the wound. While the patient was improving from the immediate

effects of the operation, and when all danger from hæmorrhage had ceased, cerebral symptoms developed and the patient died. In this case it is more than probable, as Dr. Nancrede stated in the discussion, that several vessels were involved in this injury; the distal end of the internal jugular and carotid were bleeding at the same time as the carotid. He did not think that the vertebral alone could have poured out this large stream of blood."

In addition to these cases there are three more that must be accounted for to complete the list:

(a) The case of F. VERARDINI, in which cold, rest and compression were systematically applied without much benefit, the patient escaping the observation of the surgeon and probably dying from spontaneous hæmorrhage.

(b) The case of STUBBS, of Liverpool, in which a very rare case of idiopathic cervical vertebral aneurism was mistaken for a carotid aneurism and this artery ligated without benefit, the patient succumbing to hæmorrhage.

(c) The case of SYDOW, also idiopathic, of which I only know that it resulted fatally, though not from what cause.

Other observations in which injuries involving the vertebral artery are recorded may be found scattered here and there in the general literature, but they are mere passing references which cannot be quoted with any advantage to the reader as they are too meagre in details for classification or instructive inference. Indeed, several, even many, of the cases that are included in my tables have been very insufficiently described, and I have found it often difficult to secure sufficient data for simple tabulation.

#### CONCLUSIONS.

*A. Treatment of Traumatic Aneurisms.*—(1) There are certain favorable cases (Mœbus, Weir) of traumatic aneurism in the upper and more superficial portion of the artery, in which recovery is possible, *without operative interference*. Rest, direct compression and cold, being apparently sufficient to arrest the circulation in the tumor.

(2) That in every case, when the danger of rupture of the



sac is not immediate, good results may be expected, if only as adjuvants to future radical treatment, from the systematic application of cold, local and general rest, combined with direct pressure on the sac or digital pressure over the artery below the carotid tubercle, using for direct compression ice-bags containing shot, which are easily adapted to the contour of the affected region.

(3) That in the majority of cases, the natural tendency of the aneurism is to progress rapidly to a fatal termination, in spite of the preceding measures, the sac usually rupturing in the direction of its weakest point, viz., the track of the wound that caused it.

(4) That this tendency to spontaneous rupture is markedly favored by the increased tension caused by the ligation of the carotid trunks, so frequently and unfortunately done under the impression of a mistaken diagnosis.

(5) That this deplorable result should always be avoided in case of doubt, by a careful observation of the effects of temporary compression of the carotid upon the circulation of the tumor, before applying the definitive ligature.

(6) That in almost all cases but one (Fenger's case), in which a deliberate and prepared attempt has been made to ligate the artery in the aneurismal region, or at the bleeding point, the efforts of the operator have been frustrated by the copiousness of the hæmorrhage, and temporary plugging of the bleeding spot and, at times, the more accurate plugging of the arterio-vertebral canal, have been forced upon the surgeon as methods of necessity, instead of the method of election.

(7) That, fortunately, this method of plugging, when combined with the free exposure of the bleeding region, and clearing out of the clots, has thus far given the most encouraging results, and that, the more aseptic and non-irritating the material used in plugging, the greater the simplicity of the after-career of the case, and, judging by the especially fortunate or excellent results which were obtained by Warren Stone, 1847, with plain charpie lint; J. Mason Warren, of Boston, with sponges; by King, of Hull, with oiled lint; by Küster, with iodoform gauze; by Simes,

with plain lint; and my own experience with well sterilized sponges, reinforced by iodoform gauze, it would be unnecessary to resort to styptic plugs (as in Lücke's or Kocher's cases), which have a tendency to inflame a wound and render its aseptic management most difficult. In addition, as in the writer's case, small fragments of sterilized sponge, if they are used only in plugging the canals, have the advantage that they may be allowed to remain *permanently* in the wound, where they are incorporated as grafts by the living tissues.

(8) That the use of coagulant injections is especially to be condemned; the perchlorid of iron (as in Lücke's case) having proved most pernicious. Ergotin (Langenbeck) injected into the periphery of the sac may aid in effecting a cure, but it is exceedingly doubtful if this material will distinguish itself more favorably in this region than in the treatment of other aneurisms; while the newly isolated physiological fibrin ferments (Wright) may prove less irritating, they will be likewise open to objection from the mechanical standpoint (embolism). Possibly, electrolysis and Macewen's aseptic method of securing the formation of white thrombi by "needling" may claim some success in the future, but this is very doubtful, and the most authorized opinion would point, at present, to

(9) The acceptance of the method of Antyllus, modified by the conditions of modern surgery, as the only reliable, if still dangerous, method of dealing with this always formidable condition, at least, in the majority of the cases. If this operation is decided upon, every preparation should be made to meet all emergencies. Saline infusion may be required, but a good supply of sterilized sponges, iodoform gauze and long-handled, strong hæmostatic (hysterectomy) forceps will be most useful, the latter especially in grasping bleeding points, or in applying strong pressure on the deep and unusually rigid tissues, in which they are found. The gouge, chisel, or "rongeur" forceps should not be forgotten; the rapid resection of a part of the transverse process may be required, in order to permanently secure the artery; though, usually, the plugging of the arterio-vertebral canal alone will be quite sufficient to accomplish permanent

hæmostasis, and should always be attempted first, if only as a provisional measure, or in cases in which the exhausted condition of the patient will not permit more radical procedures.

(10) In the extremely rare cases of idiopathic cervical aneurism and in the circumscribed traumatic aneurisms that are situated high up in the posterior portion of the neck, and which would not be encroached upon by any of the classical incisions for the ligation of the vertebral artery at its origin, a ligation on the Hunterian principle might be attempted with some prospect of success, especially if cold and pressure and rest were resorted to as adjuvants in the treatment. While the collateral flow from the circle of Willis is very rapidly re-established, more so even in the vertebral circuit, than in that of the carotid, it is nevertheless possible that the contents of the sac may be completely coagulated before this collateral supply has been re-established.

(11) In aneurisms that are situated lower in the neck, the Hunterian ligation, if applied by any of the classical incisions for securing the vertebral at its origin, will almost certainly end in an Antyllian operation, for it will be impossible to reach the trunk of the artery without involving the sac in the incisions.

(12) When the aneurism is well circumscribed, is high up in the neck, and the ordinary local treatment has failed, and the operator decides upon the method of Antyllus as last resort, then it is justifiable to make an incision parallel with the anterior border of the sterno-mastoid, and following the lines mapped out by Fraeys and Chassaignac, reach the vertebral below the anterior tubercle of the sixth cervical transverse process and under the sheath of the carotid compress the vertebral before it enters the foramen, with the finger of an assistant. In that way the arterio-vertebral circulation will be temporarily arrested until the wounded artery has been definitely secured at the bottom of the aneurismal cavity. By this procedure, there will be much less traumatism inflicted on the weakened patient than if a formal ligation had been attempted. In addition, the danger of secondary cerebral complication will be lessened.

*B. Treatment of the Primary Bleeding.*—(1) In the manage-

ment of bleeding wounds (non-aneurismal) of the vertebral artery, the principles of treatment are practically the same as in those which guide the surgeon in the open or Antyllian method of attacking the traumatic aneurisms of this artery.

(2) In some rare cases the nature of the injury is such that a direct attack on the bleeding point is practically impossible. This is notably true of those complicated gunshot injuries in which the missile has penetrated through the mouth, and the blood is pouring into the pharynx or retro-pharyngeal space. In these cases there is usually an associated wound of one of the carotid branches, especially the internal carotid, and the hæmorrhage is so violent that death takes place before any assistance can be rendered. The differential diagnosis cannot be attempted under these circumstances, and as plugging through the mouth is impracticable, the only hope for the patient lies in the immediate but provisional control of both the common carotid and the vertebral artery of the corresponding side, with a view of cutting off the entire arterial supply from the injured region. This result can be obtained without much difficulty by rapidly exposing the carotid sheath at the point of election and passing a ligature around the artery, which is not to be closed, however, but should be transferred to an assistant, who can control the circulation of the artery by simply pulling on the loop; the operator then presses with his finger in the depth of the wound at a point just below the anterior tubercle of the sixth cervical vertebra and in this way arrest the flow from the vertebral artery. A complete control of the two vessels is thereby obtained; the hæmorrhage is arrested and the differential diagnosis can be undertaken with more deliberation. The definitive ligature may then be applied to either one of the exposed arteries, or to both if necessary.

(3) In cases complicated with an injury of the internal jugular, high in the neck and communicating with the pharynx, the resources of surgery are reduced to a minimum. But the traumatism is so great that the shock of the injury alone will often kill the patient almost instantaneously, and if this is not the case the bleeding will be so profuse that life will ebb out long before any efficient assistance can be rendered.

(4) In the more common cases the difficulties and dangers are greatest in the lower cervical course of the artery before its entrance into the foramen of the sixth cervical vertebra, owing to the immediate proximity of vital structures, especially on the left side. Wounds of this portion are generally fatal before the surgeon is called upon to deal with them, owing to the rapidly lethal effects of associated hæmorrhage from the carotid and sub-clavian arteries and corresponding veins. In wounds of this and the remainder of the cervical portion of the vertebral artery the fundamental maxim in the treatment of hæmorrhage, viz., "to control the artery while bleeding and at the bleeding point," imposes itself as a first duty. This control can only be effected by the methods previously indicated when dealing with traumatic aneurism, and may be finally summarized in a general way as follows:

(a) If allowed by the position of the wound, deep and strong pressure should be made, by an assistant, below the carotid tubercle with a view of compressing the vertebral at this point.

(b) The wound should be freely enlarged in order to more directly expose the artery.

(c) Direct pressure with the finger in the wound should be applied to the bleeding point.

(d) Pressure on the bleeding point with strong hæmostatic (hysterectomy) forceps holding a small sterilized sponge, or by actually clamping the bleeding point *en masse*, as a substitute for the finger, and allowing the hæmostat to remain *in situ* for several days, if ligature is impracticable.

(e) Denudation or exposure of the artery in the inter-transverse space, or, if necessary, by biting with "rongeur" or gouging out the antero-external portion of the bony canal in which the artery is contained. This last procedure is perfectly practicable in any part of the vertebral canal, provided a free exposure of the transverse process is obtained and the bleeding be provisionally controlled by digital or forcipressure.

(f) Careful attention to antiseptic, systematic packing with iodoform gauze being the best protection against infection which in this class of injuries is especially liable to fatal consequences, long after hæmostasis has been secured.

TABLE I. INTRA-CRANIAL ANEURISMS OF THE VERTEBRAL ARTERY.

NUMBER.	SITUATION OF ANEURISM.	AGE.	SEX.	CAUSE OF INJURY.	OPERATIVE AND OTHER MEASURES OF TREATMENT.	NAME OF OPERATOR OR REPORTER.	DATE AND TITLE OF PUBLICATION IN WHICH FOUND.	RESULT.	REMARKS.
1.	Intra-cranial.	24	Male.	Idiopathic.	None.	Henry J. Gore, 1826, 1849.	Journal Morbid Anatomy, London, 1828, p. 24.	Died.	Discovered at autopsy.
2.	"	"	"	"	"	"	Ann. Journ. Med. Sciences, Phila., 1849, No. 3, xviii, 122.	"	No history: specimen presented to Dr. J. Neill, University of Pennsylvania.
3.	"	61	Female.	"	"	Sydow.	Torh. Svens. Lak. Sällsk. Sammank., Stockholm, 1865, 1866, 191.	"	"
4.	"	67	Male.	"	"	M. E. Echeverria.	Med. Rec., N. Y., 1869, 1870, iv, 1.	"	Discovered at autopsy.
5.	"	19	"	"	"	Lorne.	Bull. Soc. Anat. de Paris, 1869, 20, xiv, 455.	"	"
6.	"	45	"	"	"	Sevestre.	Bull. Soc. Anat. de Paris (1872), 1874, 2 s, xvii, 415.	"	Cerebral tumor; syphilitic.
7.	"	49	"	"	"	V. G. Fontarbe.	Un cas d'hémiplegie alternée par Aneurysme de la vertébral, 4th Paris, 1874, Paris, Thèse.	"	Discovered at autopsy.
8.	"	56	"	Traumatic.	"	F. Schultze.	Arch. f. path. Anat., Berl., 1875, LXV, 585.	"	"
9.	"	63	Female.	Idiopathic.	"	E. Leclaire.	Presse Méd. Belge, 1876, xxviii, 153.	"	Discovered at autopsy.
10.	"	25	Male.	"	"	"	Guy's Hospital Reports (1890).	"	Cerebral hæmorrhage; discovered at autopsy.
11.	"	30	"	"	Potass. iodid.	Anderton.	Trans. N. Y. Path. Soc., 1880, iv, 180.	"	"



TABLE II. TRAUMATIC ANEURISMS OF THE VERTEBRAL ARTERY.

NUMBER.	SITUATION.	AGE.	SEX.	CAUSE OF INJURY.	OPERATIVE OR OTHER MEASURES OF TREATMENT.	NAME OF OPERATOR OR REPORTER.	DATE AND TITLE OF PUBLICATION IN WHICH FOUND.	Result.	REMARKS. ERRORS IN DIAGNOSIS, IF ANY.
1.	Cervical.	23	Male.	Punctured wound.	Cold applications.	Mœbus, 1827.	J. d. Chirurg. und Augenheilk. Berlin, 1830, XIV, 98.	Recovered.	The common carotid was compressed, but no ligature tied because it was observed that pulsation of aneurism was not arrested thereby.
2.	Cervical first and second vert.	28	"	"	Ligature of common carotid.	Chiari, 1829.	Chassaignac: Traite clin. et pract. d'oper chir., 1861, I, 334. Translated from II Filiale Sebezio, Ann. 3, fasc 2, and also reported as Caroselli's case by Barbieri.	Died.	
3.	Between second and third vert.	20	"	"	The carotid artery was exposed, and a ligature placed around it, but not tightened.	Ramaglia, 1834.	Arch. genl. de Med. Paris, 1834, 25, V, 138-140. Translated from II Filiale Sebezio, 1834.	"	
4.	Behind angle of inferior maxilla.	"	"	"	Ligature of common carotid.	Cattolica, 1836.	Gaz. Med. de Paris, 1836, 2 s, IV, 425. Translated from II Severino.	"	
5.	Behind angle of inferior maxilla.	"	"	"	Compression and styptic application.	"	Same reference.	"	
6.	Below and behind apex of mastoid.	30	"	Stab.	Cold; compression of common carotid, and plugging ulcerating opening. Professor Respoli suggested ligature of the vertebral in the intertransverse space, <i>en masse</i> , but not done.	Professor Nunziante Yppolitio, 1838.	Monograph "Ligatura dell'Arteria vert. nei casi di Aneurismi della stessa," 16 pp. 1838. Quot. by Ghierini (A.) in his memoir, "Ferite dell'Arteria Vertebrale," Milan, 1867.	"	Diagnosis suspected in course of operation only.
7.	Between fourth and fifth vert.	40	Male.	Idiopathic.	Ligature of carotid.	H. Stubbs, 1846.	Liverpool Med. Chirurg. Journal, 1857, I, 110-112.	"	Supposed at first to be an aneurism of internal carotid.
8.	Upper cervical region.	"	"	wound?	Ligature of common carotid.	South, 1847.	Chelius, Surgery. Vol. I, p. 1067, 6th Ed., quoted by J. Holmes and Barbieri, <i>vide</i> <i>ibid</i> .	"	Fifteen days after ligation of carotid the aneurism burst into the trachea. Diagnosis made post-mortem.
9.	One inch below mastoid.	23	"	Punctured.	Ligature of common carotid.	Kluykens, 1848.	Ann. Soc. de Med. de Gand, 1848, XXI, 2.	"	
10.	Back of neck.	30	"	Stab.	Incision; plugging in intertransverse process.	Stone, 1849.	New Orleans Med. and Surg. Journal, 1849, 1850, VI, 555.	Recovered.	This was a non-pulsating tumor, and was supposed to be an abscess, and incised.
11.	Between second and third vert.	29	"	Punctured wound.	Ligature of carotid.	A. Branco, 1862.	Gaz. Med. de Lisbon, 1862, X, 597.	Died.	It was first diagnosed as an abscess, and afterwards an aneurism of the carotid or one of its branches.

TABLE II.—CONTINUED. TRAUMATIC ANEURISMS OF THE VERTEBRAL ARTERY.

NUMBER.	SITUATION.	AGE.	SEX.	CAUSE OF INJURY.	OPERATIVE OR OTHER MEASURES OF TREATMENT.	NAME OF OPERATOR OR REPORTER.	DATE AND TITLE OF PUBLICATION IN WHICH FOUND.	RESULT.	REMARKS. ERRORS IN DIAGNOSIS, IF ANY.
12.	Between atlas and occiput.	23	Male.	Punctured wound.	Ligature of carotid; aneurism injected with perchlorid of iron.	A. Lücke, 1867.	Arch. f. klinische Chirurg., Berl., 1867, viii, 78.	Died.	.....
13.	Between fourth and fifth cerv. vert.	..	"	Gunshot.	Incision; plugging; patient succumbed to repeated bleeding.	Stroppa, 1867.	A. Barbieri: Monograf. dell' Arteria Vertebrale, Milan, 1867-68, Gaz. Med. Lombard, 1867-68. "Ferite dell' Arteria Vertebrale," Milan, 1867 (Memoire).	"	This was originally an abscess which ulcerated the vertebral artery.
14.	Below atlas and axis.	20	Female.	Stab.	Cold; compression; ligature of common carotid by Monti.	Gherini		"	On post-mortem examination the artery was found to be anomalous; entered the foramen of fifth cerv. vert., which accounted for temporary arrest of bleeding by compression over common carotid.
15.	Between fifth and sixth vert.	42	Male.	Punctured wound.	Incision and plugging of artery in transverse canal.	Kocher, 1871.	Schmidt's Jahrsbericht, Leipzig, 1872, clv, 101. From Arch. klin. Chirurg., Berlin, 1871, xii, 867.	Recovered.	.....
16.	Behind and below mastoid process.	33	Female.	"	Cold; pressure; electro-puncture.	Verardini, 1872.	Bull. Soc. Anat. d. Bologna, 1872, 58, xvii, 415.	Died.	Patient disappeared, and could not ascertain result, but he was not improved when he deserted.
17.	Two inches below, and one inch post, to lobe of right ear.	28	Male.	"	Digital pressure and compression.	R. F. Weir, 1884.	Archives Medicine, New York, 1884, xi, 157, 1162.	Recovered.	.....
18.	Between atlas and axis.	19	"	Gunshot.	Ligature of left common carotid; incision of sac, and ligature of vertebral artery.	C. Fenger, 1881.	Med. Standard, Chicago, 1887, 1, 36, 35, 1887.	Recovered.	Intra-venous transfusion was required to revive patient.
19.	Fifth cervical vertebra.	41	Female.	"	Ligation of common carotid, and plugging of vertebral in canal.	G. Henry Simes, 1888.	Proceedings Philada. Acad. of Surgery, June 4, 1888. Med. News, Vol. LVIII, 1888, p. 78.	Died.	Other vessels were involved in the injury.
20.	First and second cerv. vert.	21	Male.	"	Incision of sac, and plugging vertebral in canal.	R. Matas, 1888.	Annals of Surgery, November, 1893, p. 477.	Recovered.	.....

TABLE III. WOUNDS AND OTHER (NON-ANEURISMAL) INJURIES OF THE VERTEBRAL ARTERY.

NUMBER.	CAUSE OF INJURY. WEAPON.	AGE.	SEX.	SITUATION.	OPERATIVE AND OTHER MEASURES OF HÆMOSTASIS AND TREATMENT.	NAME OF OPERATOR OR REPORTER.	DATE AND TITLE OF PUB- LICATION IN WHICH FOUND.	RESULT.	REMARKS. ERRORS OF DIAGNOSIS, IF ANY, ETC.
1.	Stab.	Adt.	Male.	Between occiput and atlas.	None.	Fabricius, 1750.	Fabricius, Philip, Conradus, of Buzbach, in <i>Precipua in cautions in sectionibus ferquisitionibus cadaverum humanum observanda</i> Bruckmann, 1750. A. Barbieri, Monograf dell'Arteria Vertebrale, Milano, 1807, VI. Traumatiques, Paris, J. B. Bailliere, 183.	Died.	
2.	Gunshot.	Adt.	"	Extreme upper portion; R.		L. J. Sanson, 1830.		"	First bleeding stopped spontaneously; then secondary hæmorrhage set in on tenth day, which caused death before carotid could be ligated. True nature of injury only discovered after death.
3.	Stab.	31	"	Second cervical vertebra; R.	Ligation of common carotid by mistaken diagnosis; plugging of wound.	N. Voisin, 1841.	Operations Chirurgicales; Gaz. Med. Paris, p. 138, 2 s, Vol. IX.	"	Death from secondary hæmorrhage; exhaustion. True nature of injury only discovered after death.
4.	Gunshot.	58	"	Second and third cervical transverse process.		Jolly, 1841.	Gaz. Med., Paris, 1841, 2 s, IX, p. 138.	"	Death was instantaneous, and source of hæmorrhage only discovered after death.
5.	Stab.	Adt.	"	Upper cervical.	Ligation of common carotid.	Thurat, 1848.	L'Ossieur: Annal. Soc. Med. d'Emulation de la Flandre occidentale, Roulers, 1848, II, 36	"	Source of hæmorrhage only discovered after death.
6.	Gunshot.	Adt.	"	First cervical vertebra.		Stromeyer, 1850.	A. Barbieri: Monograf. dell'Arteria Vertebrale, loc. cit., et Pirgoffi, Kriegs Chirurgie, 1854, p. 503.	"	Death instantaneous; other injuries.
7.	"	Adt.	Female.	Sixth cervical vertebra; L.	Ligation of inferior thyroid and vertebral arteries in the wound.	Maison neuve and Favrot, 1852.	Journal des Connaissances medico-chirurgicales, Paris, 1852, 2 s, Vol. II, p. 181.	"	Death caused by purulent infiltration of neck and sepsis.
8.	Stab.	Adt.	"	Below sixth cervical transverse process; L.	Ligation of common carotid artery; internal jugular vein, and attempted ligation of left sub-clavian artery.	J. Watson, 1853.	J. K. Wood: N. Y. Med. Journal, 1875, n. s., III, 40.	"	Cerebral complications and sepsis.
9.	"	25	Male.	Between third and fourth cervical transverse processes		J. H. Carter, 1854.	Trans. M. and Physical Society of Bombay, 1853, 4, 1855, n. s., II, 34.	"	Died almost instantaneously; no time for surgical assistance; other injuries.
10.	Gunshot.	18	"	Fifth cervical vertebra; R.	Plugging? or pressure, superficially applied	W. H. Van Buron, 1857.	N. Y. Journal Medicine, Vol. II, 3 s, 1857.	"	Other injuries; the hæmorrhage was secondary to ulceration of vertebral from retro-pharyngeal suppuration, etc.
11.	"	11	"	Second and third cervical vertebra.	Systematic plugging of wound with small bits of sponge dipped in styptic solution.	J. Mason Warren, 1861.	Surgical Observations with Cases, Boston, 1867, p. 553; also, Boston Med., and Surg. Journal, 1862, LXVI, p. 389.	Recovered.	

TABLE III.—CONTINUED. WOUNDS AND OTHER (NON-ANEURISMAL) INJURIES OF THE VERTEBRAL ARTERY.

NUMBER.	CAUSE OF INJURY, WEAPON.	AGE.	SEX.	SITUATION.	OPERATIVE AND OTHER MEASURES OF TREATMENT.	NAME OF OPERATOR OR REPORTER.	DATE AND TITLE OF PUBLICATION IN WHICH FOUND.	RESULT.	REMARKS. ERRORS OF DIAGNOSIS, IF ANY, ETC.
12.	Ulceration of artery from tubercular spinal caries.	Adt	Male.	Fourth cervical transverse process.	Plugging of bleeding abscess cavity.	Perrin, 1861-2.	Bulletin Société de Chirurgie de Paris, 1861-2, 2 s. p. 97.	Died.	This injury of the vertebral is entirely due to pathological causes.
13.	Gunshot.	Adt	"	Fourth cervical.	Plugging.	Kade, 1862.	Gazz. Med. de St. Petersburg, Vol. II, 1862; Archiv. f. klin. Chirurg. Vol. I; P. Landi, Lezioni di Chirurgia Operatoria, Bologna, 1867, p. 231; quoted also by Briolini, loc. cit.	"	Other complicating injuries of mouth and pharynx; source of hemorrhage ascertained only after death.
14.	Stab.	30	"	Between occiput and atlas.	Plugging; ligation of common carotid by mistake.	Prichard, 1863.	Augustus Prichard, Proceedings Bristol Branch British Medical Association, 1863, p. 399. Pirogoff, Krieg Chirurgie, 1864, p. 563.	"	True source of hemorrhage only discovered at autopsy.
15.	Gored by ox.	Adt	"	Before entering the sixth trans. process.	.....	Pirogoff, 1864.	Journal 1863, I, 399.	"	Other complicating injuries; exact nature of injury only ascertained after death.
16.	Gunshot.	27	"	First cervical vertebra.	Pressure over carotid.	D. C. Peters, 1865.	Am. Journal Med. Sciences, 1865, N. S., XLIX, 373.	"	The internal carotid, as well as vertebral, was injured; other complications added to the gravity of the injury.
17.	Stab.	20	Female.	Between first and second cerv. vert.	Ligation of common carotid by mistake.	Monti, Barbi-eri, 1861.	Arteria Vertebrales, Milano, 1867; and Gazz. Med. Ital.-Lombard, Milan, 1867, Vol. II, Gherini, Jr., "Ferite dell'Arteria Vertebrales," 1867, pamphlet, Tip. di Marini, via Durini, No. 31 (2mo., pp. 43).	"	The autopsy alone revealed the true source of the hemorrhage.
18.	"	30	Male.	Between third and fourth cerv. vert.	.....	Saviotti, 1867.	Caspar-Liman, Prakt. Handbuch der gerichtlichen Medizin, 5 auf., Berlin, 1871.	"	Death took place shortly after the injury, before assistance could reach patient. Source of bleeding only discovered by autopsy.
19.	"	Adt	"	Between fourth and fifth cerv. vert.	.....	Caspar-Liman, 1871.	Oestr., Jahrb. für radiat., 1873.	"	This case is of interest simply because no profuse hemorrhage appears to have followed the injury; other causes carried off the patient five days after the injury.
20.	Ulceration of artery from tubercular disease.	11	"	Second cerv. vert.	.....	Neuretter, 1873.	The Lancet, November 28, 1885.	"	In this case the vertebral was eroded by osseous tubercular disease.
21.	Stab.	25	"	Upper cervical region.	Systematic plugging with iodine gauze after opening abscess.	King, 1885.	Berliner klinische Wochenschrift, No. 48, November 26, 1883.	Recorded.	One of the transverse processes was felt to be fractured.
22.	Pathological (tubercular) abscess of neck involving second transverse cervical process.	35	Female.	Second cervical.	.....	Klüster, 1883.	.....	Died.	Hemorrhage from vertebral was perfectly controlled, but patient died nineteen days after opening abscess, from some cerebral cause, and other complications.

THE RESULTS OBTAINED FROM THE USE OF  
ANILINE PRODUCTS IN THE TREAT-  
MENT OF CARCINOMA.<sup>1</sup>

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IT seems to me not more than proper that in a discussion on carcinoma the treatment of inoperable malignant growths should find its place. For I am decidedly of the opinion and fully concur with those who maintain that it is inhumane and undignified in the medical man to simply discharge from his direct care the poor sufferers who are afflicted with a tumor inaccessible to knife or cautery, to leave them with a pitiful shrug of the shoulders to their inevitable fate. Never have I been more embarrassed than on being confronted with the necessity of telling a patient that an operation was inadvisable when he had come to my office or the hospital for the sake of having a large, painful, steadily-growing neoplasm removed. These patients should be *treated* on the same principles as patients afflicted with consumption or chronic nephritis or any other incurable disease. But not only should we prescribe for them the anodynes in different forms, or give them a nurse to regularly inject morphine hypodermically to alleviate their sufferings; not only should we satisfy ourselves with the attempt at improving their digestion and assimilation, to brighten them up and encourage them with words of hope and coming improvement, which will nearly always be

<sup>1</sup> Read before the Medical Society of the State of New York at its eighty-seventh annual meeting, Albany, February 8, 1893, being part of the "Discussion on Carcinoma."

nullified by the experience of the immediate future, but, we should aim to still attack the growth itself that can not be conquered any more by ordinary surgical means. We should try to make it yield to other modes of scientific warfare. In the case of cancer of the intestinal tract from the œsophagus down to the rectum, the physician, of course, will not tell his patient the exact condition. Manifold interesting operations are performed for this reason to-day, and will generally improve the condition of the patient. The poor sufferer is led gently down to his grave, often totally unaware of the nature of his trouble. But in tumors of head, face, neck and trunk beyond the control of ordinary means, the patient can watch and see the steady progress of the terrible foe. Inch by inch he has to give way in resignation or despair. Is it not our solemn duty to help in these instances by direct applications if there is the slightest hope of really doing any good by our interference?

The despair in these conditions is such as to lead every practitioner to confess that doctor and patient would eagerly grasp not only what would offer a promise of cure, but also anything which should afford even a chance of palliation.

Had it been left to me to select the subject of my paper in this discussion, I should have rather compared the value and results of the main methods which have been proposed up to date for the direct treatment of inoperable malignant tumors, viz.:

(1) Of the effect of the aniline dyes, especially the blue pyoktanin, in these cases;

(2) Of the inoculation of erysipelas;<sup>1</sup>

(3) Of the newest, the hypodermic application of neurine.<sup>2</sup>

But my share has been given to me: I am to speak on the results obtainable from the use of aniline products in the treatment of carcinoma. Let me add at once the word "inoperable," because it is self-understood and cannot be emphasized too strongly that *operable* cases have always to be submitted

<sup>1</sup> See the very interesting and important paper of William B. Coley: The Treatment of Malignant Tumors by Repeated Inoculations of Erysipelas, with a Report of Ten Original Cases, American Journal of the Medical Sciences, May, 1893.

<sup>2</sup> A. Adamkiewicz, Untersuchungen ueber den Krebs, und das Princip seine Behandlung Wien. Wilh. Braumüller, 1893.



to radical extirpation, and should under no condition be treated otherwise. An early thorough removal of an early diagnosed malignant growth will, as it seems at present, forever remain the best and safest treatment we can bestow on our patients. A general treatment with an anti-cancerous remedy, if scientifically established as such, may then follow.

On January 30, 1891, Prof. von Mosetig-Moorhof read a very interesting paper before the Vienna Society of Physicians, "A Contribution to the Treatment of Inoperative Malignant Growths," in which he reported on his experience with blue pyoktanin in such cases. Having read his publication, and being myself at that time engaged in experimenting with another aniline dye, the fuchsin, by external application in two of my patients with ulcerating facial neoplasm at the country branch of the New York Skin and Cancer Hospital,<sup>3</sup> I at once followed his advice and began to inject the blue dye parenchymatously. I was convinced that if von Mosetig-Moorhof earnestly recommended a treatment for this trouble and even presented his patients to the Vienna Society of Physicians to demonstrate the results of this treatment, we could rely upon him. Let me say that von Mosetig-Moorhof is the same gentleman who thirteen years ago gave iodoform to the medical profession for surgical use and at the first maintained that it was a real anti-tubercular agent. Nearly every one doubted the latter assumption at first or was unable to find it, until at last it was shown by careful experiments and observation that there is at present no better anti-tubercular remedy at our disposal in surgery. My first experience with the aniline dyes was laid down in my article, "Notes on the Effect of the Aniline Dyes, especially the Blue Pyoktanin, in the Treatment of Inoperable Malignant Growths," which appeared in the *New York Medical Record*, April 23, 1891. To-day I have been designated by our esteemed president to give you a *resumé* of the additional experience which has been gathered since that time by others and myself in this special line of treatment.

The literature on the subject is already quite extensive. The main part of it will be found at the end of this article.

<sup>3</sup> N. Y. Med. Journal, April 11, 1891; Report of N. Y. Surgical Society, Meeting of February 25.

Pyoktanin is a representative of the large chemical group of methyl-violets which are now so very much used for different purposes in medical science; thus, for instance, for the staining of specimens in microscopical pathology. It derives its name "pus-killer" from its great antiseptic power, and was thus baptized by J. Stilling, Professor of Ophthalmology at the University of Strassburg, Germany, who, together with Dr. Wortmann, made careful bacteriological and chemical researches with the different aniline dyes.<sup>1</sup> Two kinds of pyoktanin are in the market, a blue and a yellow one (pyoktaninum cæruleum and p. aureum). The latter's antiseptic power is by far smaller. In mentioning "pyoktanin" in this paper, the blue drug is always meant.<sup>2</sup> It forms small crystals which are easily soluble in water.

A very handy shape of the pure drug is the pyoktanin pencil (large and small size). If dipped in water and then rubbed on the surface of a sore, ordinary, cancerous or sarcomatous, it easily makes a crust, a dry eschar, under which cicatrization often rapidly goes on. On an ulcerated surface an ointment application is preferable, 2, 5, 10 and more per cent.<sup>3</sup> Fuchsin salve has in my hands been more useful than one containing pyoktanin. Other preparations are pyoktanin tablets, gauze, cotton, etc.

The standard solution for parenchymatous injection is 1-500.<sup>4</sup> It forms no sediment if filtered through heated asbestos. The solution is to be kept in a dark bottle with glass or rubber stopper. Only a small quantity, about one ounce, should be prepared at the time. Still better is it to prepare it fresh for each injection. For external application in moist dressings a higher percentage can be applied.<sup>5</sup> Even the pure drug may be dusted

<sup>1</sup> Anilin-Farbstoffe als Antiseptica u. ihre Anwendung in der Praxis, 2 Mittheilung, Strassburg, 1890.

<sup>2</sup> It is manufactured by Merck & Co. Their preparation is reliable and chemically pure.

<sup>3</sup> Three parts of unguentum diachyli simpl. and one part lanoline is a good formula (v. Mosetig-Moorhof); also three parts lanoline and one part white vaseline.

<sup>4</sup> Others have used it as strong as 1:300-1:100. Still it seems that 1:500 is the advisable percentage.

<sup>5</sup> For ulcerating growths also in cavities (vagina) a 1-2 per cent. creolin-pyoktanin solution (equal parts) is recommended, especially if the tumor is in a state of decomposition.

on a sore surface, as it is not an irritant and absolutely non-poisonous. It is no deodorizer, and is itself inodorous. It has no styptic qualities. Its application in many cases is followed by a diminution of pain.

For parenchymatous injections the blue pyoktanin seems so far the most preferable of the aniline dyes.

I once injected the fuchsine—which often shows so very good results in external ointment application on ulcerating growths—to the extent of 1 per cent. every second or third day in a case of recurrent cancer of the breast in an unmarried lady of thirty-five. The local effect was for a number of weeks remarkable. The recurring tumor in the breast did not spread as far as the naked eye could perceive, but during the treatment a cancerous nodule in the other breast appeared, and when after ten weeks I had to stop the injections for special reasons, the patient died of cancer of the liver with a rapidity that I have never seen equalled in a patient suffering from this trouble. I shall never use fuchsine again for parenchymatous injections. It seemed as if in this case the injections had favored the metastasis of the cancer.

If injected into the tissue the pyoktanin solution either remains at the spot for some time or it leaves the tissue by diffusion, and then by way of the lymphatics enters the blood. The latter takes place if only a small quantity of the dye is injected. No harm has ever been done by it. If more abundantly injected diffusion cannot take place or only to a small degree. The dye remains *in loco*. The deeply-stained protoplasm dies.<sup>1</sup>

The *technique* of the injection differs according to the locality. Still a number of general rules can be established and have to be borne in mind.

The injections have to be made under strict aseptic and antiseptic precautions.

The skin where the injection is going to be made must be carefully washed and then cleansed with ether.

The needles (long, short, curved and not of too small a calibre) must be boiled after using and then kept in alcohol.<sup>2</sup>

<sup>1</sup> As it appears, the drug applied in this way does not affect the healthy tissue, but only brings about a necrobiosis of the neoplastic tissue.

<sup>2</sup> A special needle with a number of lateral holes may be used.

The syringe is an ordinary well-working aspirator which holds two drachms. Before and after the injection it is washed inside and outside with a 5 per cent. carbolic solution. It shall be used only for this purpose.

The amount of the solution injected varies from one-half to three drachms, according to the size of the growth.

The spot where the needle entered is to be compressed after the withdrawal of the needle with a ball of moist antiseptic cotton until all oozing has ceased. It is then rubbed with ether and covered by a small piece of antiseptic gauze, fastened by pyoktanin—or iodoform—or ordinary collodium. Any other dressing is superfluous.

It is wise in the beginning of the treatment to distribute the dye through the entire tumor as rapidly as possible. The injections are, therefore, better made every other day, later every third day regularly.

Stilling proposed, in order to do this,<sup>1</sup> "to make use of the well-known method of von Nussbaum, who tied the arteries which fed the neoplasm in order to stop its growth. The tissue thus having been made bloodless first, should then be thoroughly dyed in all its parts and that as rapidly as possible." I have followed his advice in the case of a pulsating osteosarcoma of the femur, which had already perforated the periosteum and begun to spread diffusely into the surrounding tissue. Patient, a man aged forty-four years, from Ogden, Utah, was utterly opposed to exarticulation at the hip, which, at the same time, gave little promise for a radical cure. The femoral artery was tied right below Poupart's ligament at the German Hospital on April 30, 1891. This stopped the pulsation of the tumor. On the following days pyoktanin solution 1-300 in larger quantities, three to four drachms at a time, was regularly injected and care taken to distribute the fluid evenly and thoroughly. At different spots the tissue broke down. After a number of days a few smaller foci perforated spontaneously; a larger one had to be opened (lanced) with the knife. The sinuses discharged blue fluid (see further down) for some time and then closed (!) under the repeated use of the pyoktanin pencil. I then treated the patient regularly every second or third day with pyoktanin injections (1-300) for the following three

<sup>1</sup> Wiener klinische Wochenschrift, 1891, No. 2.

months, and had the distinct impression that the tumor which had formerly made a continuous rapid progress did not spread as far as visible. Unluckily the pulsation reappeared after some time. This new collateral circulation influenced the prognosis unfavorably, of course. When I left the city for my vacation local treatment was stopped and not resumed at the patient's home, whither he went at that time, in spite of my urgent advice to have it attended to. About nine months later I was informed that he had slipped and fallen on the street. A large swelling had formed in the region of the hip. Walking or standing was rendered impossible. I presume that the patient had fractured the (infiltrated?) neck of the diseased femur. The soft and bloody, rapidly-growing neoplasms, especially those of the bones, belong to a class of tumors which generally react very little, if at all, from the pyoktanin treatment. In this case the artificially depressed blood supply, immediately followed by rapid, diffuse pyoktanin dyeing and later by the ordinary treatment (injection every second or third day) certainly had a visible, beneficial effect on the spread of the growth as long as the patient remained under treatment.

In handling inoperable neoplasms which are directly accessible, the needle is best pushed into the healthy tissue about one-third of an inch from the border-line and then conducted forward and downward toward the base in an oblique direction. To save pain I generally advance from the same point in different directions. To do this the needle must always be retracted to the subcutaneous connective tissue and there turned. According to the size of the tumor, the calibre of the syringe and the surgeon's plan of treatment, this procedure is repeated at different spots at the same sitting.

If the growth is large and projecting, not only the bordering zone, but its tissue itself is attacked. Then I generally use a long needle and repeat the same procedure at different spots in the same sitting. The needle is introduced in its full length and then slowly retracted while the piston is pushed gently down.

With reference to the amount I am not so very particular. I have often injected four and five drachms in one sitting without the slightest detriment to the patient's general condition. Only care must be taken to distribute the fluid thoroughly and equally.

If too large an amount of the solution is deposited in a special area of the growth the tissues will break down rapidly.

It had been feared (Stilling) that the pyoktanin, if entering the blood in too large an amount, would dye the red blood-corpuscles and endanger their function. I believe with von Mosetig this fear to be groundless. In many hundreds of injections, pushing the daily dose up to four and five drachms of the solution 1-300, I have also never seen any symptoms which could be attributed to such an occurrence. I only remind of the internal use of methyl-blue, which can be given in ten-grain doses (0.6) and more daily without any detrimental general effect. Of course the solution for parenchymatous injection must be filtered. If this is not done undissolved pyoktanin crystals may produce emboli of the capillaries. It is evident that we have to be especially cautious in guiding the needle in the neighborhood of large blood-vessels. Von Mosetig lost one of his patients, a man with a sarcoma of two fists' size in the parotid region and the side of the neck, by an uncontrollable venous hæmorrhage. Post-mortem revealed that the superficially ulcerating neoplasm had infiltrated the wall of the internal jugular vein. Its breaking down at this spot had then given free exit to the venous blood. Von Mosetig concludes that we should avoid injection into tumors which involve large veins, also into those which cannot easily be reached by the needle.

If disseminated nodules are present I formerly injected their base. I have never succeeded in dyeing such a nodule by direct injection.

I believe that the rapid disappearance of the small hard nodules, which has sometimes been observed after parenchymatous injections (von Mosetig, author) does not mean reabsorption, but is an illusion which is caused by the œdema following the injections. A number of the nodules reappear soon after, sometimes rather multiplied.

As it seems the disseminated cancer (cancer *en cuirasse*) is no object for the aniline treatment.

In ulcerating growths the sore should be tamponed before the injection, or at least compressed with aseptic gauze or moist cotton during the manipulation lest the fluid should at once be



lost by that exit. The ulcer itself is rubbed with the pyoktanin pencil, or dusted with the dye in substance, or, if of offensive odor, dressed moist with the 1-2 per cent. solution of creoline and pyoktanin. The ulcerating surface should never be selected as the point of entrance for the needle, not even after very careful irrigation. The needle may convey septic material with it into the depth and set up inflammation. This is especially important in cases of cancer of the tongue, etc. This rule must be strictly observed.

In carcinoma of the cervix and body of the uterus no longer accessible to the knife, the method is somewhat complicated. Von Mosetig, Bachmaier and lately Boldt, of New York, have described it: The cancerous tissue is first thoroughly removed with the sharp curette, the bleeding surface tamponed with dry iodoform gauze. Twenty-four to forty-eight hours later the gauze is removed, and after proper disinfection of the operating field the injections are begun.<sup>1</sup> A long syringe is required. At last dry pyoktanin powder (or handier, as I believe, a small pencil) is introduced into the uterine cavity and a large-sized cotton tampon put in front of the cervix. An occlusion

<sup>1</sup> Boldt describes the procedure as follows: "The patient being placed in proper Sims's position and with the respective speculum and a Hunter's depressor, both *brightly* polished and applied *correctly*, one can readily see the entire uterine cavity *after* the curetting. The parts must then be thoroughly dried with aseptic absorbent cotton. Now the needle . . . is introduced. At the fundus uteri, the syringe having been filled with an aqueous solution of pyoktanin (blue) 1-100, the needle is inserted from 0.5 centimetres (one-fifth inch) upward, even to its full length, according to circumstances; *i. e.*, the thickness of the respective part where the injection is made; and while pushing the needle deeper the fluid is gradually pressed out by the piston, so that the deeper tissues are infiltrated with fresh staining fluid. One syringe-ful of pyoktanin solution is made to answer for two or three punctures. Next the liquid is injected into the parametria on either side, then the posterior vaginal wall, and last the anterior infiltrated vaginal wall; sometimes making as many as fifteen punctures at one sitting. I begin with the injection at the most distant part, because on withdrawal of the needle some of the fluid returns through the needle puncture and at once discolors the tissues immediately surrounding; so, were this to occur more proximally, the field for work would become so clouded that the injections could not be made with the requisite amount of precision." Boldt had a total of thirteen cases. All improved except two. The progress of the growth, if any took place, was much slower than it would be if the disease were left to pursue its course without this treatment.

pad must be worn, for even with the greatest care the clothing becomes somewhat soiled. The treatment is repeated every second day.<sup>1</sup> Cancerous nodules of the vagina are attacked as those of the surface of the body.<sup>2</sup>

That a malignant tumor of the œsophagus, stomach and intestinal tract, of the large intra- and retro-peritoneal glands is inaccessible to the needle is obvious. Happily the rapid strides of operative surgery within the last years, as gastrostomy, jejunostomy, colostomy and the manifold attempts at establishing an anastomosis between the different portions of the intestinal tract often produce such a wonderful temporary improvement in these cases, that many a patient dies after months of comparative comfort and satisfaction without having ever known that he had been afflicted with an incurable disease. Here (as well as in all other cases of carcinoma) the aniline dyes may be given internally in gelatine capsules. In my experience methyl-blue (Merck) is then the preferable drug. Pyoktanin is not well borne by the stomach.<sup>3</sup> The daily doses may be pushed up to ten, twelve and more grains.

<sup>1</sup> Before the patient calls at the doctor's office the cotton is removed at home with the help of an attached string and a douche of several quarts of warm water used (Boldt).

<sup>2</sup> A few months ago I saw, in consultation with Dr. L. Fischer of this city, a woman of about forty-five years, with a far gone ulcerating cancer of the uterus (cauliflower) and vagina. Bleeding was profuse, odor very fetid, patient confined to bed. Continuous tamponade of the vagina with aseptic gauze, moistened in creolin-pyoktanin solution (2 per cent.  $\bar{a}\bar{a}$ ) was agreed upon. As Dr. Fischer kindly notified me on inquiry (July 30): The patient now has "no pain, which formerly was one of her first severest symptoms. She has not emaciated; on the contrary she is gaining flesh. She has a good appetite, sits up occasionally. Odor and profuse discharge disappeared since third week of treatment. Bleeding rare; no inconvenience. Vaginal examination shows distinct presence of carcinoma." I almost doubt that creoline alone would have produced such an effect.

<sup>3</sup> Methyl-blue was first used internally by Ehrlich (Ueber schmerzstillende Wirkung des Methylenblau, Deutsche medicinische Wochenschrift, 1880, No. 23). Lang saw good effect of its internal administration in cases of cystitis and pyelitis (Wiener klinische Wochenschrift, 1891, No. 6, p. 112). Methodical internal application of methyl-blue as a help in hopeless cancer cases was first tried and recommended by Drs. J. Rudisch and M. Einhorn of this city (New York Medical Record, March 21, 1891, Correspondence). The latter pronounced it an effective drug also in a certain percentage of cases of urinary troubles (gonorrhœa, pyelitis, etc.), and chronic skin diseases (New York Medical Record, Correspondence, 1891, p. 643). Lately it has

The drug will dye the urine from a light green at the beginning to a deep blue color.<sup>1</sup> The patient should be told that this will occur. Timid persons might else be easily frightened. If bladder tenesmus is caused by the larger doses, a tip of a knife full of nutmeg powder, scraped from the surface of a divided nut, or some carbonate of magnesia will generally help. In cancer of the pylorus von Oefele<sup>2</sup> saw good results (lessening of abdominal pain, gain of appetite and consequently weight) from the internal use of pyoktanin. He ordered his patients to take a gelatine capsule, containing one-sixth of a grain of cocainum phenylicum and one and a half grains of antifebrine into the empty stomach early in the morning. Four hours later, after a light breakfast, a large capsule with a 2 per cent. alcoholic pyoktanin solution was taken (amount in each capsule is not stated).

If the bladder be the seat of an inoperable cancer, irrigation with pyoktanin solution 1 : 1000, better 1 : 2000 or 3000 every third day may be tried. In two such cases of von Mosetig the transparency of the urine and the constant tenesmus were evidently improved and the hæmaturia ceased. (I have had no opportunity lately to use pyoktanin in patients afflicted with an inoperable tumor of the bladder, but I have often done so in cases of chronic (gonorrhœic) catarrh of the posterior urethra and bladder. There 1 : 3000 not infrequently created intense

been recommended by P. Guttman and P. Ehrlich, of Berlin, as the best specific against malarial fever (Ueber die Wirkung, des Methylenblau bei Malaria; Berliner klinische Wochenschrift, 1891, No. 39), which statement has since been confirmed by many authors. I have now and then observed a very beneficial subjective effect by the internal administration of methyl-blue (Merck) in patients who suffered from inoperable carcinoma. They claimed to feel brighter and more vigorous since taking the drug. I cannot well imagine that this should be due in every one of these cases to the anti-malarial effect of methyl-blue, although this cannot be denied. The proper maximum dose *pro die* seems to be about ten to fifteen grains. Yet higher doses have been given. They sometimes produce, however, acute albuminuria. It is best administered in capsules, each containing  $1\frac{2}{3}$ -3 grains (1-2 decigrammes).

<sup>1</sup> It may be of interest to state, that the dye never enters the saliva and perspiration. The parenchymatous injection, even of large amounts of pyoktanin solution, does not color the urine. This is, perhaps, a proof for the assumption, that the dye remains for some time in the tissues, in which it had been deposited. However, I have often seen that pyoktanin, if internally administered, does not color the urine.

<sup>2</sup> Reichs Medicinal Anzeiger, June 19, 1891, No. 13.

burning; 1 : 10,000 was still of value. The dose was then gradually increased. I must confess, that the effect of the drug in a number of these cases was remarkable, though it failed in some.) Lately "a case of poisoning by methyl-blue" has been published by Z. Drzewiecki,<sup>1</sup> of Warsaw, Poland. Why Drzewiecki calls the symptoms, evidently caused by the dye, "poisoning," I cannot see. They only point to a marked irritation of the bladder, produced by continued large doses of the drug.

In impermeable cancerous stricture of the rectum or sigmoid curvature, where I had performed inguinal colostomy, repeated enemata with pyoktanin solution 1 : 3000 : 4000 with the patient in knee-elbow position, made the neoplasm break down rather rapidly; I have seen this in two patients. The obstruction was thus removed so that the lower end of the gut could be easily cleansed. These irrigations produce, however, a very annoying tenesmus, sometimes so much that the patients refuse to use them any further. In inoperable cases of cancer of the rectum, von Mosetig applied pyoktanin ointment tampons after preliminary superficial curettement.

Now, what are *the effects* of the aniline dyes as observed during the treatment and how can they be explained?

As in my first preliminary communication on this subject to the New York Surgical Society (March 13, 1891), I shall divide the effects—of course, provided that any set in—into subjective and objective.

(1) The "analgesic" effect is, evidently, the most important among the subjective effects.

Patients who, on account of continual pain have long become victims of the morphine habit, declare after the first parenchymatous injections, which may have been quite painful first on account of the suddenly increased intraparenchymatous pressure: "Doctor, what did you do with me? My pains are so much less. I slept in the last nights better than for many weeks." And this lessening of pain is not of a passing character. It becomes more apparent the longer the treatment is adhered to.

<sup>1</sup> New York Medical Record, 1893, No. 7, p. 202.

It is, therefore, not exceptional that in such cases the hypodermic syringe is soon laid aside and natural sleep refreshes and stimulates and brings new hope to the poor sufferer.

If a patient is afflicted with an ulcerating neoplasm, especially epithelioma of face and scalp, the aniline dye is applied in the form of a salve, or dusted on as a powder, or rubbed on the raw surface with the moist pencil. Not very rarely we will hear the remark after some time: "Doctor, of all the many treatments I have had, this is the best." I believe the drug has still to be found which can produce the same beneficial effect!

And what is the probable explanation of this occurrence? It is, as it seems, given in the experiment of Ehrlich, who proved, that living nerve tissue is dyed first and quickest. The latter, evidently, ceases to be a conductor until it has freed itself of the dye by diffusion. Before this can have taken place, the next application has already been made.

A direct consequence of this main and most striking effect is

(2) One of not less importance to the patient, "the improvement of function of the part involved."

I shall never forget the second call at my office of an unmarried lady, teacher in a public school,<sup>1</sup> who had an inoperable recurrent cancer of the breast. "O, doctor," she said, "my arm had been bent down to the chest for weeks and now already after one injection I can move it more freely." This functional improvement, which certainly was not imaginary, continued and increased the longer the treatment was adhered to and with additional use of massage and gymnastic exercises. The patient was even able on different occasions to comb her hair and button her dress in the back, which had previously been impossible. Von Mosetig states: "Patients, whose tongue had been immovable on account of cancerous infiltration could, after parenchymatous injection with pyoktanin, move it easier, could talk better, could chew and swallow with less trouble; in cases of large neoplasms of the neck, which had necessitated a forced, stiff position of the head, the latter could soon be moved without also turning the trunk; women with inoperable cancer of the uterus, who had

<sup>1</sup> The case has been mentioned above: fuchsin injections.

been confined to bed, could get up and walk around and often do light work in the household." The latter was also seen by Bachmaier.

Is it to be wondered if a patient beneficially reacts upon the aniline treatment, that less pain (without the use of morphine) and improved function induce better appetite and assimilation, that strength and weight increase, that in one word

(3) the general condition often shows an unmistakable change for the better?

Is it further to be wondered at, and can there at the same time be anything more gratifying than to see

(4) these poor, pitiable fellow-beings gain new hope, to observe their brightened eyes and their cheerful willingness to punctually subject themselves to a long-continued, sometimes painful, treatment? This treatment requires a decided exertion of will on the part of the patient, because the often-repeated prick of the needle, as well as the forced deposit of a certain amount of fluid in an area, which is often already infiltrated, naturally creates some pain. But how powerful this will becomes, even in the weak. It is therefore in my mind decidedly correct and only humane to assure these patients also of a continued *objective* improvement, even if the treatment, *once started*, does not produce the desired effect to the medical eye. A few encouraging words by the doctor will still more increase this favorable mental impression of the pyoktanin treatment.

With reference to the *objective* symptoms we observe general and local.

General symptoms, *very* rarely seen, are: Nausea or vomiting, weak and slow pulse, headache, general malaise. They may set in after intraparenchymatous injections, also after the internal use of methyl-blue. They appear on the same day or the day following the injection. As a rule, they do not come at all. Now and then there is a slight rise of temperature, usually subsiding within twenty-four to forty-eight hours. This may be due to imperfect asepsis. In no case did the injections ever prove really harmful to the patient.

The local symptoms are different in ulcerating growths and in those still covered with healthy skin.



In the first it will often be seen, especially in rodent ulcers, if the dye be applied in solution or in a salve, that the sore surface soon presents a more healthy, rather granulating appearance. The former nasty discharge becomes scanty, at the borders cicatrization sets in.<sup>1</sup> If pyoktanin is dusted upon the surface in substance or thoroughly rubbed in with the wet, large pencil, an eschar forms. This comes off in the shape of dry gangrene without suppuration. Cachexia is thus held in check. Small growths can definitely cicatrize under this eschar in a number of weeks (epithelioma of nose and eyelid, Stilling). If the infiltrated margin of an epithelioma of the face (rodent ulcer) be injected, the tissue generally breaks down, the ulcer first seems to spread rapidly. But it only breaks down as far as the infiltration goes. If healthy tissue be reached the antiseptic properties of the aniline dyes can take effect, the ulcer begins to heal.

Did the neoplasm already invade the deeper tissues, a marked improvement can not be expected from this treatment. It has been seen (von Mosetig, author) that now and then disseminated small cancer nodules rather rapidly appear in the neighborhood of the hard border-line of a facial epithelioma, if the latter be treated with injections. According to my experience, we will do best not to deposit the dye parenchymatously in these cases, but to satisfy ourselves with applying it on the sore externally.

In unbroken neoplasms we observe after parenchymatous injections the following symptoms:

(a) *Edema* of the injected part and its neighborhood.

It appears either acutely and then often accompanied with slight redness (non-inflammatory) and pain on pressure, or more often in a subacute form. The *œdema* can remain for a long time. At last it disappears without interference, quicker with the help of gentle massage. Its presence is most probably due to the compression of the smallest veins by the dye which is

<sup>1</sup> It is fair to state here that such changes of a rodent ulcer of the face can be observed under manifold treatment, provided the latter be conducted on antiseptic principles. Only very lately von Bergmann has again called attention to this fact (Berliner klinische Wochenschrift, 1893, No. 28, p. 685). This effect of the aniline dyes, therefore, is not a specific one.

deposited in the parenchyma and can remain *in loco* for weeks without being reabsorbed (von Mosetig).

(b) *Breaking down* of the injected tissue (softening) with perforation of the skin.

This seems to set in more rapidly in using stronger solutions (1 : 200 or 100). A sinus or a number of sinuses are established which give exit to a thick dark-blue fluid. Microscopical examination proves this to be débris of the injected neoplasm, not colored pus.<sup>1</sup> Sometimes a few of these softened foci join and form a swelling of about hen's-egg size, which, of course, creates pain on account of intraparenchymatous pressure. Then the surgeon has to open it, but not by a long incision, as splitting the roof of an abscess, but by a small puncture hole, just sufficient to let out the dyed fluid. Under proper antiseptic treatment these sinuses will discharge the same blue fluid for some time and "then close." The tumor later will be found to have materially shrunk in such spots. If the sinus persists and pus escapes, infection has taken place. Then, of course, the patients are by far worse off than if nothing had been done. This point was especially emphasized by Billroth.<sup>2</sup>

<sup>1</sup> In one of my cases (recurrent cancer of breast) careful microscopical examination of this fluid was kindly made by Dr. I. Adler, of New York. The doctor's report reads as follows: The fluid, of pale violet color and containing small scraps of a solid matter, which formed an uneven and irregular sediment, was submitted to microscopical examination, and showed the following:

(1) A colorless, serous, slightly viscid fluid. In this fluid were suspended globules of free fat in great profusion and of all sizes; fat-crystals; innumerable leucocytes of all kinds, principally, however, of the large polynuclear species; a comparatively small number of red blood-corpuscles, all these of natural appearance and entirely unstained. Furthermore, large masses of granular amorphous detritus, either suspended loosely throughout the fluid or else gathered together into more compact masses. These latter were sometimes diffusely stained of a very pale, grayish-violet tint.

(2) The solid particles, which consisted of portions of fatty tissue and of patches of epithelial cells. The fatty tissue showed the regular polygonal fat-cells, sometimes emptied of their contents, sometimes filled with them. In either case a distinct and diffused bright violet-staining of the membrane could be made out, while the fat itself never showed any color. The epithelial cells were of the large, irregular, flat pavement species, either singly or in groups. Wherever an epithelial cell was found, it was at once recognized by its deep saturated stain. The coloring was entirely diffuse, and no nucleus could be made out without the aid of acids.

<sup>2</sup> Vienna Society of Physicians, March 13, 1891. Wiener klinische Wochenschrift, No. 12, p. 236.

(c) Breaking down (aseptic necrobiosis) or regressive fatty metamorphosis of the injected tissue with subsequent reabsorption (*i. e.*, without perforation of the skin).

It was proved by microscopical examinations [von Mosetig l. c. (Riehl, Zerner, Jun.), author, l. c. (I. Adler)] that the pathogenic cell elements are dyed by pyoktanin in the living body. The same occurs with normal connective tissue, muscles, nerves, glands. But whereas the physiological tissue with its biologically more powerful cell energy is not in the least altered by this coloring, rather quickly rids itself of the dye by diffusion, provided the dye is not forced into the cell in too large a quantity, the neoplastic elements succumb, and this the sooner the oftener they are attacked.<sup>1</sup>

This simple, "mechanical" explanation seems the most plausible: We color the living protoplasm of the tumor so thoroughly that it breaks down and thus is destroyed.

A large tumor, however, if injected, does not soften or break down in every spot. Still we get in a number of cases the impression during the treatment that the neoplasm's further spread is arrested (fatty degeneration and reabsorption?).

To explain this latter phenomenon—the arrest of further growth with subsequent shrinking—von Mosetig had first hoped to find in microscopical sections of freshly and only once stained malignant tissue the nuclei of the cancer cells colored. He is of the opinion that the cancer cell is an epithelial cell, and that life and death of the nucleus determine proliferation or death of the cell. But he was first greatly disappointed, rather embarrassed, to find on microscopical examination the nuclei, as well as the cancer cells themselves, unaffected by the dye, whereas connective tissue and muscular fibres appeared stained. However, if the specimen was left exposed to the air the entire cut surface

<sup>1</sup> That this really happens could be nicely seen in one of my cases, a woman with a recurrent inoperable cancer of the breast, where after pyoktanin injections a number of fistulous tracks had formed. When they were split under ether a thick ramified mass of a deep blue color was found lying within normal, uncolored, slightly-indurated tissue. This evidently necrosed tissue could be easily shelled out with the finger or the sharp spoon; in many spots it still adhered to its surroundings. (See above, Dr. Adler's report.)

slowly turned violet without additional dyeing. How to explain this interesting phenomenon? The chemical experiment shows that hydrogen discolours a methyl-violet solution, the blue or violet aniline is reduced to white, the so-called leukaniline. The latter easily combines with oxygen and soon takes the blue color again.<sup>1</sup> On the ground of this experiment, von Mosetig advanced the theory that perhaps the pathological cells or their nuclei contain a specific chemical substance, which is able to reduce the aniline dyes in such a way that the latter lose their blue color; in other words, that this at present unknown substance reduces the blue aniline dye to the white, the leukaniline. (When the tumor then has been extirpated and sections have been prepared from it for microscopical examination, the leukaniline in them, being exposed to the oxygen of the air, turns blue again.)

Now, von Mosetig still goes one step further. He says April, 1891): A poisonous chemical product has lately been found in carcinomata by Adamkiewicz, which, inoculated in rabbits, kills them by paralysis of the brain in a few hours. Perhaps this poisonous product reduces the aniline dye and thereby becomes neutralized itself. This again might then explain the consequent regressive fatty metamorphosis and arrest of further growth.

This hypothesis has something very fascinating, provided the new theory on the ætiology of carcinoma could be sustained. This is the theory of Adamkiewicz, namely, that the so-called epithelial (cancer) cell is not a tissue-cell at all, but the cancer-parasite (*coccidium sarcolytus*). This parasite, says Adamkiewicz, produces a poison, "cancroin," with its local effects and its general infection. With this theory as a basis we might thus plausibly explain the curative effect of the aniline dyes; the strong antiseptic quality of pyoktanin

<sup>1</sup> If we put aside a well-corked bottle filled (not entirely) with a deep blue urine of a patient who had taken methyl-blue internally for some time, we will soon see that, beginning at the bottom of the bottle, the color changes from blue to green and then to yellow. After a short while the entire fluid has the normal urine color and all oxygen has been absorbed. If we now open the bottle and leave the fluid exposed to the air, the entire fluid slowly turns blue again, beginning on the upper surface and slowly advancing to the bottom. This procedure may be repeated many times with the same fluid.

paralyzes or destroys (neutralizes) the poisonous effect of the "cancerin," and therewith destroys the work of the cell itself. The cells then undergo fatty degeneration and are reabsorbed, or their remnants are eliminated after perforation of the covering skin, provided they have been destroyed by the dye.

That Adamkiewicz's theory, which had first been enthusiastically commented upon by a number of gentlemen (Bidder, L. Pfeiffer), is not well founded, that his experiments are insufficient and his conclusions deceptive has lately unquestionably and very strongly been shown by Hanseman (*Berliner klinische Wochenschrift*, 1893, No. 28, p. 683) and Paltaux (*Weiner klinische Wochenschrift*, 1893, No. 37, p. 677).

It is further necessary to state that this supposed poison is claimed to have been found in cancerous growths only, and none so far in sarcomata, which also react upon the aniline dyes.

The breaking down with perforation or with reabsorption naturally produces shrinking of the tumor. This is sometimes clearly perceptible by inspection (retraction of the skin due to real cicatrization) or by palpation.<sup>1</sup> In many cases the treatment produces no visible results, especially as stated above in very bloody and soft, rapidly-growing tumors of the bones. But even in injecting them a slower growth is often seen. One gets the impression as if the further spread of the neoplasm were now held in check, as if it were "under control." On the other hand, I have already mentioned that I personally observed a cancer spread and invade other organs with a marvelous rapidity, especially after the treatment had to be interrupted. But there fuchsin had been used. Whether this really had an influence I should not venture to decide.<sup>2</sup> Other authors report a lasting after-effect of the treatment. Still I believe these cases are exceptional. It will in the majority of cases be the rule that they have to be treated with the aniline dyes until their death.

<sup>1</sup> In two of von Mosetig's patients with cancer of breast, treated with injections, the infiltrated axillary glands slowly decreased in size and disappeared spontaneously. This observation shows that the dye is in part carried away by the lymphatic current and can still influence neoplastic elements which had left the primary focus.

<sup>2</sup> Burghard also observed "a distinct restraining influence" as long as the injections were made, and a "greatly increased rate of growth as soon as they were discontinued."

Now, Mr. President and gentlemen, if you ask me, did I cure one of my patients with inoperable carcinoma, I have to answer: no. But others have, or at least have succeeded in beneficially influencing large inoperable growths so much, that it might be called "a cure." One of von Mosetig's patients, a gentleman with an immense inoperable adeno-sarcoma of the pelvis, who had been pronounced incurable by many celebrated men abroad, was so far improved by the color-cure that he again entered society. In reading such a report, which two years ago stimulated me to at once begin with this treatment here, one or the other of you may shake his head and murmur: "Error in observation," "passing effect!" But, gentlemen, let me add that von Mosetig saw this patient eight months later and still he was able to note the same improvement. The same author had treated as early as 1883 an inoperable round-cell sarcoma of the right groin of a man, aged fifty, with parenchymatous injections of a 1 per cent. solution of anilinum trichloratum. Eight weeks later the œdema of the lower extremity had disappeared, the large tumor was reduced to a nodule of the size of a walnut, and the ulceration had healed. The patient left the hospital cured and attended to his business. He died of pneumonia one year later. The neoplasm had not recurred. A woman of sixty-six years with an immense myeloid sarcoma of the inferior maxilla of one year's standing received eighty-four injections in all (almost eight ounces of the drug). After seven months' treatment the sarcomatous mass had disappeared, the remaining bony shell was empty. Patient was presented to the Society of Physicians on January 30th and March 13th, 1891. No recurrence after eight months. Nanu, of Bucharest, has reported a number of cases of malignant tumors, where pyoktanin (1 : 3 drachms of a 1 per cent. solution every third day) appears to have effected a cure. Lindner presented a patient to the "Freie Vereinigung der Chirurgen Berlins," on January 9 1893, with an osteosarcoma of the face, which originally had involved the entire temporal region and a portion of the cheek. Within three months parenchymatous injections of the blue pyoktanin, repeated every third or fourth day, had made it



shrink for about two-thirds of its former size; the patient's sufferings had ceased. Diakonoff, of Moscow, has come to the conclusion by his observations, "that blue pyoktanin actually possesses a power of destroying malignant new growths, though its action is not energetic." More instances of the same kind could be cited. On the other hand, many only had failures and concluded that the method had "no serious value whatever." Even those who gave the aniline dyes a *fair* trial in the treatment of inoperable carcinoma have no doubt experienced many disappointments. But now and then they were forced to the remark: "No doubt there is something in it." There *are* effects of the injection or application of blue pyoktanin which so far no other drug could produce. Of course, not every case responds favorably. But does every case of tuberculous disease respond favorably to creosote and iodoform?

I abstain from giving any statistics. If anywhere, then here, we need large numbers to draw conclusions. Nobody could so far present them. Von Mosetig gives the histories of ten picked cases out of about seventy, treated in this way. Of the seventy, one-third were afflicted with sarcoma, two-thirds with carcinoma. The number of injections varied between 21-125, the amount of pyoktanin used between 21-230 grammes (two-thirds to eight ounces), time of treatment, one to eight months. The ten cases had been greatly improved, two, as it seemed, cured. My own experience is based on about twenty cases. Not of all I could keep track. Some uneducated patients are apt to leave the hospital (more rarely our care in private practice), if the result of a continuous, generally slightly painful (puncture and injections) interference does not "rapidly" present favorable results to their eye. Often I have been very favorably impressed by the effect of the treatment, at times I was rather enthusiastic. Still more often I have been disappointed, especially if the treatment had to be discontinued for one or the other reason. Still, according to what I have seen, I fully agree with von Mosetig's conclusion, "that it has been proved by practice, that parenchymatous injections of inoperable malignant growths with pyoktanin can produce disappearance of the malignant tissue—though in exceptional cases

—and can heal neoplastic ulcerations.” How soon and whether the tumor will recur in favorable cases, can not yet be determined. But if only one out of ten cases were objectively benefited, the treatment deserves trial and should not be at once thrown aside as “ineffective.”

Summing up I should say: The use of the aniline dyes in the treatment of inoperable carcinoma (malignant growth) generally is “a palliative treatment,” no cure. In *very* rare cases this treatment may cure. Carcinoma and sarcoma of hard type (especially the latter), are better influenced than soft ones; those of the soft tissues easier than of the bones; those with a scanty blood supply more successfully than rapidly growing neoplasms with abundant circulation. The disseminated cancer is no object for the aniline treatment. The treatment with parenchymatous injections requires a perfect knowledge and application of the principles of aseptic and antiseptic surgery. If a doctor does not understand them, or can or will not take time to follow them strictly, I should call out to him: “Hands off; do not try it; you must do harm, and will be disappointed; your tumor will soon suppurate and slough and your patient die of acute or chronic sepsis.” Without antisepsis the treatment is bound to harm rather than to do good. It also requires a good deal of patience and perseverance on the part of the surgeon as well as on that of the patient. It will, in the very best case, require a continuous attendance for many weeks or months. On account of the necessary antiseptic precautions the treatment is time-robbing. It will, therefore, in my estimation, only come into favor in the treatment of patients who are able to pay.<sup>1</sup> The poor should be admitted to a hospital. But then we need cancer-hospitals, which have the outspoken purpose to also admit inoperable cases and care for them without regard to the length of the treatment. There it may then be made out, which treatment may possibly best improve the given case, whether the use of the

<sup>1</sup> I personally never begin this treatment without having first properly explained to the patient's relatives what may be expected of it. Dr. Boldt writes me (July 13, 1893), that he has “given up the pyoktanic-treatment of inoperable cases of cancer of the uterus, unless a patient is sent for that particular treatment.”

aniline dyes locally, internally and parenchymatously, or inoculation with the coccus erysipelatis (*streptococcus*), if necessary repeated, or perhaps also the subcutaneous injection of neurine. Or we may even anticipate the discovery of some other chemical substance, which shall be able to neutralize the toxins produced by the cancer-cells, provided neurine (Adamkiewicz) should, as it seems, not stand the test. Probably a combination of the methods might deserve preference.

Mr. President and gentlemen, half a year ago, the French physicians and surgeons under the leadership of Duplay, of Paris, united and formed the "Ligue contre le Cancer."<sup>1</sup> Let us follow their example; in this immense country with its thousands of hard working, studying and experimenting physicians, let those who take special interest in the fight against this most dreadful scourge come together and form for the promotion of this special branch of science and for the benefit of suffering mankind, "The American League against Cancer."

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## SOME CRITICAL OBSERVATIONS UPON CERTAIN FORMS OF SPINAL INJURY.<sup>1</sup>

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IT is the purpose of this paper to direct attention to the class of spinal injuries followed by a train of vague and indefinite symptoms that are particularly manifest at remote periods of time subsequent to the receipt of the traumatism. It is customary to classify injuries of the cord and its immediate environment as follows:

(1) Those injuries affecting the vertebral cartilages and ligaments without an involvement of the cord and its membranes at the time of the accident.

(2) Vascular injuries of the cord and membranes.

(3) Injuries of the cord substance, whether demonstrable or not at the time of the accident.

Basing my opinion upon a somewhat varied and large experience and observation, I conclude that a large majority of these injuries in the region of the cord are confined in their immediate and remote manifestations to the muscles and vertebral ligaments. In a small proportion of cases we have manifest immediately, evidence of a gross cord lesion, frequently associated with a fracture or dislocation of the vertebra. In a smaller proportion of cases the evidence of a lesion to the cord may not manifest itself until some hours or days subsequent to the receipt of the injury; while in the minimum of cases the unmistakable evidence of a lesion may first appear at quite remote periods of time thereafter.

<sup>1</sup> Read by title before the American Surgical Association, May, 1893.

Injuries followed by gross lesions are rarely encountered in court. A large majority of the victims perish. In the cases surviving, if accompanied with a liability, they are generally compromised before coming to trial, consequently a large majority of the medico-legal cases are of the variety known as sprains or contusions of the muscles and vertebral ligaments, and not accompanied by an injury directly or indirectly to the cord proper. It has been customary with many writers, notably Erichsen, to assert concussion of the cord as being the etiological factor in the symptomatology of the vast majority of these cases. From a period of time covering two decades the views of Erichsen have been quite generally recognized by the profession. By concussion we understand to imply an arrest, partial or complete, of the normal molecular life of the tissue. When the injury was in the vicinity of the spinal column and there was not resulting directly therefrom a gross lesion, we have generally considered any or all the varied train of symptoms resulting therefrom as due to an arrest of the normal molecular function of the cord, or spinal concussion. A large majority of the surgeons of to-day deny emphatically that the cord can be readily concussed. In cases of extreme flexion, however, where the force of the vulnerating body is crushing, we may have resulting therefrom a concussion, contusion, or laceration of the cord proper. In the latter school of cases, unfortunately for the patient, we have manifest a gross lesion, followed in a large majority of cases by early death. Hippocrates asserted that no injury to the head, however trifling, should be despised or overlooked. In Mr. Erichsen's series of lectures, first published in 1866, he applies the aphorism of Hippocrates to all injuries of the cord and its immediate environment. That the spinal column and its contents are not as sensitive to traumatism as the brain, we fully recognize at the present day. It is differently situated and differently protected.

- (1) The brain is more vascular than the cord.
- (2) It is in closer proximity to the surrounding osseous walls.
- (3) It is not suspended as is the cord.



(4) It is heavier than the cord, and responds more directly to vulnerating bodies.

(5) The weight, position by suspension, and protection of the cord is such that it will tolerate a traumatism that in other regions of the body, particularly the cranium, would immediately be followed by serious results.

Mr. Erichsen, with several eminent neurologists, maintains that, as a result of a molecular arrest or concussion, there resulted months thereafter grave lesions ending in death, or a varied train of symptoms pointing to functional disturbances only that renders the patient's existence most unbearable.

In the study of these cases we will do well to overlook Erichsen's concussion theory entirely, and determine the probable future behavior of a given case by an investigation of the patient's general condition of health at the time or before the receipt of the injury; likewise from a physical and psychical standpoint. It is my opinion that the very few cases terminating in lesions at very remote periods are not due to local changes, but rather due, very greatly at least, to certain dyscrasiæ or pre-existing panpathic conditions. With recent progress in the surgery of the central nervous system and nerve trunks, we have ascertained that there exists a great regularity in the repair of important nerve structures subsequent to the receipt of a traumatism. Regeneration of nerve tissue is the rule, not the exception. In some of the lower animals the entire cord is regenerated subsequent to its removal. Experience and observations convince us that the quite uniform tendency of injuries to nerve trunks is toward repair or regeneration. Particularly does this apply to the young and middle ages of life.

Confining this paper to the class of cases most frequently encountered in court and to the ones that in their subsequent behavior are the cause of the greatest amount of criticism, we must confine our attention to those cases classified as developing organic lesions at remote periods of time and those recently classified and recognized as traumatic neuroses. If we deny the concussion theory with its subsequent lesions, we would naturally infer that there occurred in those cases followed by remote

lesions, one of two conditions: first, that there resulted at the time of the injury an actual cord lesion that was insignificant at the time of its receipt and was the factor in developing remote degenerative changes; or that these lesions resulted from the general shock, physical and psychical. It is my opinion that, in the small proportion of cases of spinal injury that develop a remote lesion, it is due in most cases to the minute lesion occurring at the time of the accident. If not, we are forced to admit that a trifling injury, having little or no effect upon the patient at the time of its receipt, is attended with a degenerative lesion resulting in purely functional disturbances. If the lesion develops in the latter class of cases it can only be inferred that there exists a dyscrasia or pronounced impairment of the vital forces at the time of injury. Given a normal condition of health, or a near approach thereto, the recognized tendency following the class of cases referred to in this paper is toward recovery. Given a pronounced impairment of the vital forces upon the receipt of an injury, we conceive that in a small proportion of cases we may have resulting therefrom a lesion that may develop at remote periods of time subsequent to the receipt of the injury. The exact factors leading to the result of the lesion is not fully understood; the consensus of opinion seems to be, however, to ascribe the result as greatly due to trophic innervation, particularly of the vasomotor nervous system.

To Oppenheim is given the credit of first suggesting the term *traumatic neuroses* to the class of cases particularly referred to in this paper. It is certainly easier to make an analysis of these cases under this nomenclature than by referring them to the so-called Erichsen's disease, spinal concussion, etc. It is my opinion that few, if any, of the symptoms arising in these cases can be due to a concussion, immediate or remote. It is certainly more in keeping with modern physiological and pathological views to refer the results as arising from minute cord lesions, remote changes following vasomotor defects, and to the purely neurotic condition, resulting in its most characteristic psychical features. Oppenheim has made some most valuable contributions in recent years upon these injuries so frequently followed

by functional disturbances. He particularly calls our attention to the conflict in attempts at diagnosis, and the great variety and diversity of symptoms arising therefrom. Westphal refers these symptoms in a majority of cases as being due to small myelitic points and analogous to multiple sclerosis. Ziegler referred them to spinal irritation; some writers to traumatic neurasthenia; while Oppenheim changed his original views of organic lesions, which he had imbibed from his teacher, Westphal, and suggested that, in lieu of spinal concussion, we adopt the term traumatic neuroses, thereby discarding his earlier views of a lesion.

The accompanying classification by Seguin gives a fair impression of the scope of these cases not manifesting the gross lesion of the cord at the time of injury :

Injuries to the nervous system without evident gross lesions. Physical and psychical shock.	Immediate symptoms.	<ol style="list-style-type: none"> <li>1. Transitory paralysis.</li> <li>2. Diabetes (mellitus or insipidus).</li> <li>3. Amnesia (total or partial).</li> <li>4. "Traumatic neuroses."               <ol style="list-style-type: none"> <li>a. Psychic (depression or hypochondriasis).</li> <li>b. Hysterical or neurasthenic.</li> <li>c. Local or neural.</li> </ol> </li> </ol>
	Late or secondary symptoms.	<ol style="list-style-type: none"> <li>5. Paralytic and atrophic symptoms (sclerosis and progressive muscular atrophy); dementia paralytica; epilepsy.</li> <li>6. Pott's disease of the spine; cerebral tumors.</li> <li>7. Malingering.</li> </ol>

While we recognize that rapid progress is being made in neurology, we are forced to suggest that this branch of special work is quite far from being an exact science. A prominent neurologist in a recent paper asserts that upon the subject of spinal injuries neurologists are iconoclasts and that an authoritative book upon this subject has not been written, and that when it is written it will not emanate from the pen of a surgeon. Looking at existing literature on this topic from a surgeon's standpoint, I quite fully agree with my friend the neurologist, that an authoritative book has not yet been written. We care

not its source when issued, but in the interests of justice we sincerely trust that it may soon be forthcoming. It is well known that the subsequent history of these cases after successful litigation is not in accord with the prognosis so freely volunteered by the plaintiff's expert at the time of the trial. Following a great portion of this litigation the withered limb suddenly regains its usefulness, and the crutch and cane are discarded, and at a time least expected by the public or the credulous jury. Millions of dollars have been wrongfully filched from the coffers of railway corporations in the last few years. An examination of the records of the United States and District Courts of St. Paul will reveal that in the period of one year verdicts of several hundred thousand dollars have been rendered against corporations for personal injuries. In one court verdicts amounting to fifty-five thousand seven hundred and fifty dollars appear against one railway company alone, in a period approximating one year. From the nature of the evidence in these cases the public will readily infer that the knowledge possessed of the pathology and prognosis of these cases was painfully uncertain, or that the average expert was a most unreliable witness. We are not disposed to criticise Judge Storey too sharply in dividing unreliable witnesses into three classes, as follows: "Liars, blanked liars, and medical experts."

The acute observer will ascertain upon analysis of the causes leading to the fierce criticism of the profession by the public that there are many factors that have been potent in bringing about the present situation. First, one of the principal causes lies in the unfavorable attitude of the public and bar in regard to medical evidence. This is wholly or very greatly due to the entire absence of any efficient statutes regulating the selection of experts, or the manner of eliciting evidence before the courts and jury. The regulation of expert evidence, both medical and scientific, has never been protected or regulated in America by adequate statutory enactments. In most countries the expert is selected for recognized fitness by an impartial judge. The absence of statutory regulations governing this entire subject of expert testimony places the witness of opinion upon the same

footing as the witness of fact. This custom makes him subject to the same questionable privileges regarding procedure in examination that is accorded in the examination of the witness of fact. The experts or witnesses of opinion should be wholly independent of influence, and permitted to arrive at their conclusions in their own professional manner. The second greatest factor bringing about the present public sentiment undoubtedly lies in our inability to arrive at a definite diagnosis and afford a probable prognosis of a very large proportion of these cases. An element of uncertainty will continue to exist in a very large proportion of these cases. Particularly does this apply to their prognosis. If we exercise the same conservatism, however, in the witness-box that we do at the bedside there will be fewer cases of outraged justice, and the traduced name of the profession receive less opprobrium.

## TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

*Stated Meeting, May 10, 1893.*

ARPAD G. GERSTER, M.D., President, in the Chair.

### CASE OF EXTIRPATION OF CANCEROUS GOITRE.

Dr. WILLY MEYER presented a man, who was fifty-two years of age, and who had first noticed a swelling on the left side of his neck five years previously. Within the next three years it slowly grew towards the median line of the neck, but caused no special trouble until recently. About Christmas last the patient slipped and fell on his back, the trunk resting on the sidewalk and the head hanging backward into the gutter. Since that time the swelling had increased rapidly. When the reporter first saw him, about four weeks ago, he presented a large, hard, nodular swelling on the anterior aspect of the neck, reaching from one sterno-mastoid muscle to the other. It moved up and down with the larynx. There were several large glands posterior to the sterno-mastoid muscles. As the patient had a good deal of trouble in breathing and swallowing, and also pain, and as the growth seemed not to have broken through the capsule of the thyroid, it was decided to extirpate the goitre, choosing the incision proposed by Prof. Kocher, following the fold in the skin reaching from one sterno-mastoid to the other, and cutting down in the median line to the manubrium sterni. The left superior thyroid artery being reached, it with its vein was divided between two ligatures. Proceeding further, the inferior thyroid artery was seen. In this case there were apparently two arteries. They were only ligated, not cut. The entire growth was then lifted up. It was firmly attached to the trachea, from which it had to be separated with the knife. The right side was then attacked and freed in the same manner as the left with the knife. When the operation was nearly finished and the lower pole of the right side reached, it was found that here the cancer had perforated the capsule and that cancerous



tissue surrounded the common carotid. There was also a sub-sternal process of the tumor. The growth was, therefore, shelled out with the finger as completely as possible. For this reason it was not thought advisable to go on and remove all of the outlying enlarged glands in the neck. The wound was closed, a tube was introduced alongside the muscles on either side, and a small strip of iodoform gauze was also inserted. The operation had lasted nearly three hours, but the patient stood it very well, and no special rise of temperature followed. The next day he was found to be aphonic, and had continued more or less so since, now and then being able to speak, however, with a hoarse voice. Dr. Meyer thought he might have wounded the right inferior recurrent nerve, but the laryngoscopic picture revealed no paralysis of either vocal cord, both the cords being nearly parallel with each other and remaining so continuously with inspiration and expiration. Whether it is a paralysis of the abductors or a slight spasm of the adductors he was unable to say at the present time. The patient may yet regain his voice. He has now been fully relieved of his former troubles.

Dr. MCBURNEY said that in this case the question might arise what procedure we should recommend when complete extirpation of a malignant goitre was impracticable. He thought in such cases we could relieve the symptoms due to pressure upon the trachea with less danger either by dividing the isthmus, leaving the two lateral portions, or taking away one half only. Such a device works very well indeed as far as relief goes. Of course, in Dr. Meyer's case the tumor appeared to be entirely within the capsule, and there was a chance of completely extirpating the disease, but he was speaking only of cases where we know we cannot remove the whole disease and can only relieve symptoms.

Dr. KAMMERER mentioned several operations for malignant growths of the thyroid which had been under his care. If total extirpation is advisable in any case it is in these tumors, provided the disease is confined to the gland alone a fact which we are unable to tell by mere manipulation of the tumor before proceeding to an operation. When the tumor is confined to the thyroid gland operation justifies a fair prognosis. Of several total extirpations for malignant disease he recalled two in which the growth had not perforated the capsule. One was a very large cancerous thyroid, and there was no recurrence after extirpation for four years, when recurrence did take place, and it ran a rapid and fatal course. In another case in which the diag-

nosis of cancer was established without doubt, the patient is still living, without any recurrence, seven or eight years after total extirpation. He did not think the operation for malignant goitre, if the tumor is simply of the thyroid gland, is much more difficult than the extirpation of large parenchymatous tumors. But when the growth has perforated the capsule, the operation, of course, becomes one of the most difficult. In connection with this subject he presented a specimen of a thyroid node in which he had that afternoon attempted enucleation but had been unsuccessful. It was in the case of a girl of twenty-two years, whose left thyroid lobe was much increased in size. After careful examination he excluded a cyst and came to the conclusion that it was a node and a proper case for attempting enucleation. He made a longitudinal incision over the tumor, carrying it through the muscles upon the capsule, and then began dividing the parenchyma of the gland. He had only made an incision about an inch long when the hæmorrhage became so alarming that he had to desist from this procedure. He made several vain attempts at controlling the hæmorrhage with artery forceps, but finally was compelled to resort to a running suture supplemented by compression. The moment compression was applied the entire node collapsed, emptying itself through the small incision in the thin glandular capsule. He then resorted to typical extirpation, ligating the thyroid arteries and taking out the entire left lobe, finally cutting through at the isthmus, according to Kocher. This case demonstrates the advisability of not adhering too strictly to one method—*i. e.*, enucleation or extirpation. In enucleating free hæmorrhage is to be expected, but when it is excessive the operation ought to be abandoned in favor of typical extirpation, wherein the necessary hæmorrhage is to a certain extent under our control.

#### WITZEL'S METHOD OF GASTROSTOMY.

Dr. MEYER remarked that he had very recently presented to the Society the specimen of a stomach from a case in which he had performed gastrostomy for cancer of the œsophagus by Witzel's method for the first time, the patient having died within six days thereafter of double pneumonia. Shortly after he performed the same operation upon a female who died of heart failure within thirty-six hours. Not long after another patient came under his care whom he now presented to the Society. He is fifty-six years old, and acquired specific disease thirty years ago. He first noticed difficulty in swallowing

three years ago. Under the use of iodide he improved greatly for a time, being soon again able to swallow. Three months ago he suddenly developed great difficulty in deglutition; could not even drink fluids. Again, although an apparent turn for the better took place, yet he followed advice and submitted to an operation. Four weeks ago (April 13) Witzel's method of performing gastrostomy was resorted to, viz: Fenger's incision; blunt division of the outer portion of the rectus muscle; primary opening of the stomach by a very small hole, the peritoneal cavity being well protected by aseptic gauze compresses. Then the tube was buried in the stomach wall for about two inches, and the entire area of operation on the stomach lined by peritonæum. The outer wound was closed by stitches up to its inner angle, where the tube passed out. A strip of iodoform gauze drained the peritoneal cavity; another one was passed down alongside the tube to the stomach wall. The man had only recently recovered from a severe attack of pneumonia, and after the operation signs of this disease developed in the same lung area and there was some rise of temperature, still he made a good recovery. He had to be made to sit upright after the operation, still no special leakage has ever set in. The patient took his supper about two hours ago. If the tube was now removed from the fistula and the man made to cough as hard as he could, not a bit of stomach contents would be pushed out. The skin around the fistula was in perfect condition. The man is now able to swallow bread and meat. It is the reporter's intention to let him first pick up somewhat and then have him swallow a perforated shot on a silk thread. Then to wash out his stomach, fill it with water, and, with the help of the cystoscope, search for the lower end of the thread and extract it with a slender dressing forceps. With the aid of this end projecting out from the stomach opening, the other drawn out through the mouth, œsophageal dilators can be passed from below upward. If the character of the œsophageal stricture should prove to be simply specific, the prospects are, of course, quite favorable, with reference to restoring the normal calibre of the œsophagus. After sufficiently stretching the wound the tube may be withdrawn from the gastric fistula, permitting it to close with the possible result that this artificial canal, which traverses the abdominal and stomachic walls *obliquely*, may heal spontaneously, without any further surgical interference. On the other hand, it is possible, in this case, that a malignant growth has developed on the basis of old specific ulcerations and scars. Further observations will soon prove the character of the disease.

## FRANK'S METHOD OF GASTROSTOMY.

Dr. MEYER presented another patient, illustrating Frank's method of performing gastrostomy. The man is sixty-two years old and has had symptoms of malignant stricture of the œsophagus since last spring. When he entered the hospital he was very low, was unable to swallow even a drop of water, and had to be put on rectal alimentation and stimulation preparatory to an operation. The operation was performed sixteen days ago according to the recently described method of Frank, which is only suitable in cases of cancerous stricture of the œsophagus, where a permanent gastric fistula is to be established. The operation is simpler than that of Witzel. The peritoneal cavity is opened in the line of Fenger's incision, pretty close to the border of the ribs. Then the stomach is pulled forward and a cone of about one to one and a half inches of the anterior wall is held outside and in front of the wound with the help of one or two silk slings. The base of this cone is now lined with peritonæum all around, and thus the abdominal cavity is at once closed. Now a second incision is made *above* the border of the ribs, about three-quarters to one inch long, only penetrating the skin; the interposed bridge of skin is bluntly undermined and the stomach cone pulled underneath it and out of the upper wound. There it is incised with the knife and stitched to the skin. The incision can be made very large. Still a one-half to three-quarter inch stomach-wound will later always allow the largest tube to pass with ease.

Dr. Frank has done the operation of gastrostomy in this way three times. He was enabled to feed the patient through the opening at once, introducing scraped meat and bread through a large syringe. The patient does not have to wear a tube at all, yet in spite of coughing nothing oozes out.

Before operating on this patient, Dr. Meyer had had an opportunity to try the method on another patient at the German Hospital, but he was extremely low, and died of heart failure the following day. The patient presented was operated upon sixteen days ago. On pulling the stomach forward, some trouble was experienced in holding it there, because of the resistance offered by the malignant growth at the cardia. As a consequence of the undue traction exerted upon the attachments to the skin, a part of the lower circumference of the opening in the stomach has somewhat retracted, and the upper wound, which had been made at least three quarters of an inch above the border of the ribs, has been pulled down below this

border, yet the result has been very good. The patient does not wear a tube. At the time of feeding a tube is always easily introduced. This patient also had a full stomach when presented. More water was added, and he was made to cough hard; not a drop escaped. He believed that Frank's method of gastrostomy will become the standard operation for malignant stricture of the œsophagus, especially if the tumor is situated above the cardia. For cardia tumors of the stomach, which cannot be well pulled forward, Von Hacker's operation may be more advisable. In cases of cicatricial *tubular* stricture of the œsophagus, requiring a temporary gastric fistula, Witzel's operation should be preferred.

#### OSSIFYING HÆMATOMA.

Dr. VAN ARSDALE presented a case and read a paper. See July ANNALS OF SURGERY, page 8.

Dr. B. F. CURTIS had had the pleasure of seeing Dr. Van Arsdale's operation upon this case, and the pathological appearances were of the greatest interest; the way in which the fibres of bony structure interlaced with those of the tendons and the insertion of the muscles was particularly striking. The ossification was not confined under the periosteum, but extended outside, the tumor not having over the greater part of its surface, as he recollected it, any true capsule.

Sometime before seeing this case, he saw one which he thought, from studying this case, must have been of a similar character. It occurred in a young woman who had been struck pretty sharply on the forearm. A tumor appeared, the arm became quite lame, rotation was interfered with, but under domestic applications the swelling became considerably reduced. When he saw her four weeks after the injury, she had a considerable thickening on the posterior aspect of the radius at the junction of the upper and middle thirds. The swelling also dipped down between the radius and ulna, and limited supination mechanically. Its surface was hard and nodular. Fearing from the history of the patient that a tubercular process might be developing, and doubting whether it could be a sarcoma from traumatism of such recent date, he immobilized the arm perhaps two weeks, at the end of which time the pain and tenderness on active motion had disappeared, but the tumor remained, though slightly smaller. When he saw her nearly a year afterward, rotation was still limited and the tumor was present. He thought there had been traumatic hæmorrhage under the periosteum, and ossification

took place, forming a smooth tumor with apparently a distinct capsule. The question of diagnosis between ossifying hæmatoma and malignant tumors is, as the author has said, a very important one.

#### HYSTERECTOMY BY THE SACRAL ROUTE.

Dr. C. K. BRIDGON presented the following case: Annie Hughes, aged forty-five, mother of seven children, had generally enjoyed good health, was not aware that she had ever suffered from any womb trouble, and was compelled to enter the Presbyterian Hospital, January 30, 1893, on account of inability to pass water.

The house surgeon experienced some difficulty in emptying her bladder, encountering an obstruction in the urethra, about one inch from the meatus. The cervix was displaced to the right of the median line. It was the seat of cancerous ulceration, was fixed by infiltration of the right broad ligament, and by a tumor as large as the two fists which occupied the left half of the pelvis, rising slightly above the brim; bi-manual palpation made it out to be spherical in form. Impulse conveyed to it from above passed through the cervix, but it was almost immovable and of stony hardness. It was believed that the difficulty in urinating was due to some twist of the urethra, caused by traction of the tumor. A small portion of the cervical growth was removed, and after examination by the pathologist was pronounced malignant.

In view of the fact that it was probable the patient would have to be catheterized for the remainder of her life, it was considered best to advise an operation, and inasmuch as the fixed character of the tumor in the left half of the pelvis made it inoperable by the vaginal method, it was decided to do the modification of Kraske, recommended by Schede.

*Operation.*—February 13, ether narcosis, patient prone with thighs flexed at right angle with trunk over the end of a table. Incision in median line from over the middle of sacrum to within an inch of anus. After clearing the lower part of the sacrum, coccyx and sacro-sciatic ligaments, the lower part of the sacrum was divided with a chisel, and the hæmorrhage during the separation of the bone was disagreeably free, and only controlled by its rapid removal, when it almost ceased at once, only requiring sponge pressure to control it thereafter. The pelvic fascia was then divided along the middle line; the rectum was separated by blunt dissection, and displaced to the left. The cavity of the peritoneum was then



opened, and what was at first supposed to be an atrophied uterus, connected closely to the right wall of the pelvis by an infiltrated broad ligament, and continuous with the tumor of bony consistence, that was impacted in the left half of the pelvis, was with very great difficulty delivered through the wound. Mass ligatures were then applied to the pelvic attachments of the right broad ligament, and the remainder of the operation, the division of the vagina and the section of the left ligament, was facilitated by the traction exerted through the medium of the tumors. It was now found that what was supposed to be an atrophied uterus was really the cervix, and that the bony mass occupying, and almost unmovably fixed in the right half of the pelvis, was the body of the uterus, occupied by an old fibroma, covered by a complete unyielding shell of calcareous matter, and bent at a right angle with the cervix. The junction of the cervix with the body was so attenuated as to resemble broad ligament. The convalescence of this patient has been exceedingly slow. The wound, April 12, is nearly, and probably will be finally, healed by the end of the month, that is, nearly three months after date of operation.

He had had five sacral resections during the past few months. Of course they were done in exceptionally severe cases, which could not have been successfully dealt with by other methods; but the operation is a severe one, the mortality great, and in the cases where they recover from the immediate effects of the operation, the closing of the large gap, which is left behind, is necessarily tedious, and he apprehended that in quite a number of the cases control over the bladder would be lost.

## EDITORIAL ARTICLES.

### CZERNY ON PELVIC OPERATIONS BY THE SACRAL ROUTE.<sup>1</sup>

CZERNY, of Heidelberg presented at the last meeting of the German Surgical Congress his recent opinions concerning these operations. He speaks in a general way of the malignant tumors for which these operations are done, and expresses the view that the laws applying to the etiology of the infectious diseases cannot be applied to these. For this reason he believes that the treatment of malignant tumors with spermin, cancroin, or the so-called internal disinfection with creolin, lysol and pyoktanin cannot be regarded as rationally founded methods. Even though the empirical seeking after a remedy for carcinoma is justifiable, Czerny says that it was impossible for him to follow the teaching of Adamkiewicz, which amounted to nothing more than jumping boldly at a conclusion wearing a scientific mantle and which reason contradicted. It is a matter of some note that this view should have found expression at this important meeting.

According to his view it simply remains to go on endeavoring to improve the methods of operative treatment of the malignant tumors. In the extirpation of the carcinomatous uterus Schede has met with very great success by the sacral method. Czerny is of the opinion that this method will go through the same phases as did sacral extirpation of the rectum. First there was a conservative observation and strong criticism, followed by an enthusiastic adoption of the method, and then gradually it was given its proper place and legitimate application.

He has done eight sacral operations for carcinoma of the cervix. Only one case died from shock, because of the very extensive opera-

<sup>1</sup> Verhandlungen der deutschen Gesellschaft für Chirurgie, XXII Kongress, 1893.

tion performed. Seven recovered from the operation, but at the end of three and one-half years only one was alive without any recurrence, the others having died with return of the disease. He is of the opinion that his frequent recurrences were due to the method which he employed.

In view of the frequent and constant recurrences, he is of the opinion that the open vaginal wound invites the implantation of carcinomatous cells during the operation. It is, however, best to make the vaginal incision in order to outline the growth before attacking it from behind. He has convinced himself by repeated operations that it is best to open Douglas' sac to the right of the rectum, and that the operation can be done quicker and with less loss of blood than on the left side. In order to lessen as much as possible the possibility of infecting the vaginal wound and peritoneum with carcinoma, it is best to use the method described by Herzfeld.<sup>1</sup> Slight deviations from the method will be necessary, of course, in every atypical case. Herzfeld, Müller and Hochenegg, in their last reports, have endeavored to limit, and even to dispense with, the resection of a portion of the sacrum, and to remove as little more than the coccyx as possible.

He goes on to deduce some conclusions from the following cases: A young woman of twenty years with disease of the body of the uterus presented herself, complaining of metrorrhagia and an offensive discharge. It could not be ascertained whether an abortion had been done or not. The uterus was curetted and decidua cells were found, and the diagnosis of abortion was made. The hæmorrhages quickly returned and a second curettement was done. This time masses were obtained which resembled sarcoma cells, but mistaken for large decidual cells. The uterus was uneven and nodular, and its removal was advised. When the patient came to be operated upon the uterus had reached the size of a child's head, and a metastatic growth had developed in the vagina. The patient was very weak and suffered very much. The tumor was so putrid that it could

<sup>1</sup> Centralblatt für Gynäkologie, 1893, No. 2.

not be removed through the abdomen. It was too large to be removed per vaginam. She bore the sacral operation well and returned to her home, where she soon died from metastasis. The tumor was a myxo-sarcoma with large decidua cells.

In a second woman, aged fifty-three years, the portio vaginalis had been amputated seventeen years before for carcinoma. She finally developed profuse metrorrhagia. A number of gynæcologists advised against further operation. When she came to Czerny she was so reduced by the hæmorrhage and pain that it seemed that any operation must be fatal. She had a myoma corporis uteri the size of a man's head, a paracervical tumor, and besides these a growth of the endometrium which at first was not diagnosed as malignant. An extirpation of the paracervical myoma was done per laparotomy, the uterus was drawn down and tied about the neck with an elastic cord, and the stump buried after the method of Schröder. Healing progressed well. A secondary peritonitis developed in the third month, from which she eventually recovered. Then a foul-smelling discharge began, which was supposed to be from malignant degeneration of the cervix. One year after the first operation operative interference was resorted to a second time. The remains of the cervix and portio vaginalis were found to be enlarged and firmly fixed in the pelvis; in short, a condition in which neither laparotomy nor the vaginal method were applicable, but which could best be reached by the sacral route. This was done with perfect satisfaction. The endometrium was the source of the malignant disease which had necessitated the operation.

In two other cases dermoid cysts had become fixed in the pelvis. One had been treated for years by incision and curetting. A foul discharge continued from the vagina. Examination showed a firm sac, which could not be separated from the vaginal wall. This Czerny removed very easily by the sacral route. The same was the case with a dermoid of the ovary, which was complicated with carcinoma of the rectum, which also indicated the sacral operation. Another case in which there was a paracervical myoma, that was abso-

lutely immovable by digital examination, he regarded as indication for sacral extirpation. It is a fact that paracervical myomata, even when firmly wedged in the pelvis, can be easily enucleated through the abdomen when there are few vessels in the capsule; but on the other hand, every surgeon who has done many such operations knows that often these tumors can only be removed by extirpating the whole uterus, and sometimes their removal is impossible.

It is Czerny's opinion that the sacral route is the shortest to the parametrium in order to enucleate such tumors. He reports further the case of a young man with a large paravesical tumor situated between the rectum and bladder, above the prostate, in the region of the right seminal vesicle, in which the sacral operation served the very best purpose. This tumor, the size of a child's head, had developed very rapidly, and was growing forward to the side of the bladder. Cystoscopic examination showed nothing more than a prominence in the interior of the bladder. The urine was normal. It was, therefore, supposed to be a myoma of the prostate, though the rapid growth spoke more for sarcoma. An exploratory parasacral operation was done, and the tumor exposed on the right side of the rectum. In order to make more room a transverse incision was carried across the fourth sacral vertebra, the bone chiseled through and turned over to the left side. The tumor could now be easily removed in pieces.

Through this opening it was very easy to see the bladder; and the tumor, which sprang from the vesicula seminalis, could easily be separated from the mucous membrane and muscular wall of the bladder. The ureter was not injured, and healing progressed rapidly.

He was less fortunate in two cases of atresia ani, in which the perineal section, which was first attempted, did not accomplish the desired end. The atresia recti in one case was situated two and a half centimetres above the anus, and he was unable to find the gut through the perineal section. It was in this case that he first did an osteoplastic resection of the sacrum and coccyx, and by this means was able to find the lower end of the rectum without further trouble.

In a second case of atresia, the same osteoplastic method had to

be pursued because the outlet of the pelvis was filled by a parenchymatous organ, which was later found to be a kidney. The unusually small pelvis was so filled by the misplaced kidney that even after resection of coccyx and sacrum the rectum could not be found, and it was necessary to do a colostomia iliaca.

Czerny has also operated upon a chondro-sarcoma by the sacral method. In this case it was necessary to resect the sacrum as high up as the second vertebra and also to resect the right tuberosity of the ischium. The third root of the sacral plexus was injured by this procedure, because it was involved in the tumor mass. As a result of this injury to the nerve trunks the patient was left with paralysis of the bladder and rectum and weakness of the lower extremities. She died eighteen months later from recurrence.

He reports two more cases of malignant tumors of the female pelvis in which he employed this method. One was a case of recurrence of sarcoma of the body of the uterus, which, after extirpation, had recurred between the bladder and rectum, and was causing the greatest suffering. He enucleated the tumor as much as possible, curetted and treated with 50 per cent. zinc chloride gauze, which gave the patient relief at least for a few months.

In a second case the tumor originated from the symphysis sacroiliaca and compressed all the neighboring organs. This tumor he enucleated in the same way, and cauterized the remainder with zinc chloride. This patient, who had been regarded as lost, has after many years shown no sign of recurrence, and is in the most perfect health. It is evident that in such cases as these results can be obtained by the sacral operation which by no other method could be hoped for, though it must be acknowledged that in the field of operations for malignant tumors much more must be hoped for than has yet been accomplished.

Czerny believes that the sacral osteo-plastic operation will constantly find a broader application in the treatment of growths, many of which cannot be removed in any other way.

JAMES P. WARBASSE.



KÜMMELL ON RESECTION OF THE KIDNEY.<sup>1</sup>

AFTER experimenting on animals by removing pieces of varying size from normal kidneys, Kümmell learned that the operation could be done without danger. He has since had opportunities to practice upon the human subject the resection of diseased kidney tissue, a report of which operations he made before the last German Surgical Congress.

The first case upon which he operated was a woman aged forty-one years. She began to complain of pain in the abdomen and loin. There was never any pain on urinating. She grew weak and lost appetite, and finally sought medical aid. The physician found a painless tumor the size of a fist just below the right costal arch. At this time, aside from the general weakness, pallor and pain in the loin, and especially in the right side, she complained of nothing. It could not be decided to what organ the tumor belonged until the urine had been examined. At times the urine contained a considerable amount of purulent sediment, and at other times it was clear and normal. The reaction was acid. A small amount of albumin was occasionally present. There was no cystitis. The patient had never passed any gravel. Nine months after the onset of the symptoms, the tumor was exposed by an incision parallel to the free border of the ribs. A fluctuating tumor springing from the upper third of the kidney presented. After separating a few adhesions, the half of the enlarged organ was brought out, and the fluctuating part freely opened. A large amount of pus escaped. The finger introduced into the abscess came against a stone moulded in the shape of the pelvis, which was removed with great difficulty. From the pelvis pus had forced an opening back through the parenchyma and formed a large abscess cavity in the substance of the organ. The walls of this cavity were cut away with the scissors, and the cavity partially closed with sutures. The hæmorrhage could not be completely checked, so the kidney was sutured in the abdominal wound and tamponed with iodoform gauze. More than a third of the entire organ was removed.

<sup>1</sup> Verhandlungen der deutschen Gesellschaft für Chirurgie, XXII Kongress, 1893.

The wound healed well. At no time did a drop of urine escape from the wound. The urine contained much pus immediately after the operation. This steadily diminished till, after eight days, it was normal. After a month she returned home with a small granulating wound. Just before this wound closed a small bit of gravel escaped. Three years later she is still perfectly healthy.

The second case reported was that of a man fifty-four years old, who presented himself in a condition of cachexia and complaining of pain in the region of the right kidney. The urine was strongly stained with blood, cloudy and albuminous. Examination under an anæsthetic disclosed nothing abnormal about the kidneys, and examination of the bladder with the soft and hard catheter was negative. Washing the bladder had no influence on the condition of the urine. Cystoscopic examination was negative. The right kidney was possibly slightly larger than the left. This kidney-region was always very painful and tender. A diagnosis of malignant disease of the kidney was made, and the organ exposed by an incision parallel to the costal arch. The kidney was not especially firmly fixed in its bed, and was easily drawn forward. The microscopic appearances of the organ were normal as to consistency, size and color. At the upper end was discovered an area which was anæmic and dense and sharply outlined from the rest of the organ. It was about the size of a walnut. This was regarded as malignant, and the whole mass excised in the shape of a wedge, the incision being carried well into healthy tissue. Suturing the kidney wound did not suffice to check the bleeding, as the sutures were prone to cut through the tissue. The organ was fixed in the abdominal wound, and the hæmostasis effected by means of iodoform gauze tamponade. The wound healed rapidly, but the general condition of the patient did not greatly improve. Soon after the operation the hæmaturia ceased, though the urine continued cloudy and albuminous. At the end of three weeks the patient returned to his home, the wound having healed. Six weeks later the patient returned in a wretched condition. He complained of intolerable vesical irritability. The urine was deeply stained with blood,

and sometimes he passed pure blood. The fluid was mingled with larger and smaller tumor masses. The examination of this material, which could also be removed from the bladder with the spoon catheter, gave the diagnosis of carcinoma of the bladder. Cystoscopic examination could not be made because of the hæmorrhage, nor was it necessary.

After opening the bladder above the pubis, it was found to contain a partially disintegrated tumor the size of the fist, which was connected to the posterior wall of the bladder by a pedicle not much thicker than the thumb. This was cut away from the mucous membrane and muscular layer by an elliptical incision around its base, and the wound in the bladder united by a few deep sutures. The opening into the bladder was closed, after a permanent catheter had been introduced. At the end of fourteen days the skin wound was found healed, the catheter was removed, and the fistula healed by granulation. After that time the patient had no more hæmaturia. The amount of albumin in the urine increased, and after a short period of general improvement he began to sink, and presented all the signs of nephritis. Ten weeks after the operation he died of pneumonia complicated with empyema.

At the autopsy it was found that the bladder wound was united and that there was no sign of recurrence or infiltration. The kidney which had been operated upon was firmly adherent to the capsule and surrounding tissue, but there was scarcely a trace of the operation to be found. The whole organ was the seat of an interstitial nephritis. The same condition was found in the piece of kidney which had been resected at the operation; instead of being a malignant new-growth, it was interstitial nephritis.

The third case reported was one of echinococcus of the kidney. The patient was a woman, aged thirty-four years, who had been well until her sixteenth year, when she began to suffer from simple anæmia. She was married at the age of nineteen, and had three normal labors. The pregnancies in no way influenced her strength, though she was never able to do heavy house work. At the age of thirty-two years

she began to grow much weaker, and since that time was confined to the bed much of the day. At that time a physician discovered a swelling of the right kidney. The right leg became swollen to such a degree as to interfere with locomotion. A few months before the operation she developed severe pain in the right side and in the abdomen, which kept her in bed. Examination showed the right kidney movable, and easily felt through the emaciated abdominal walls; it was considerably enlarged, smooth and of normal shape and resistance, very tender on pressure; the left kidney was apparently normal; the spleen seemed somewhat enlarged; liver normal; urine clear and containing no pathological elements; in the middle of the right leg, on the outer side of the tibia, was a fluctuating tumor the size of an hen's-egg; a smaller tumor of the same sort was found in the muscle on the outer side of the right thigh; these two last tumors were removed and found to be echinococci; it was therefore concluded that the enlargement of the kidney was due to the same parasite; the organ was exposed by an incision parallel with the free border of the ribs; the kidney was easily brought up into view, and found to be about twice its normal size; prominences or changes of color were not observed; at the upper end was a fluctuating place; incision at this point disclosed an echinococcus bladder; the organ was then freely incised, and a cyst cavity opened containing more bladders; smaller cysts were found outside of this in the kidney substance; these cysts were all excised in wedges, and the wounds sutured; as in the two previous cases, to control bleeding, the organ had to be fastened to the abdominal wound and tamponed with iodoform gauze; about a half of the kidney was removed; the pelvis remained intact. The patient made a good recovery.

Czerny, Bardenheuer, Socin and others have reported cases of resection of portions of the kidney, instead of removing the whole organ, for abscesses, horseshoe kidney and benign tumors.

JAMES P. WARBASSE.

## INDEX OF SURGICAL PROGRESS.

### GENERAL SURGERY.

**I. Cocaine as an Hæmostatic in Hæmophilia.** By Dr. ZOEGE VON MANTEUFFEL (Dorpat, Russia). The writer was consulted in regard to a weakly Hebrew boy of twelve years, who, after extraction of a lower molar tooth, had not ceased to bleed from the cavity for two days, in spite of tamponade and bandage. Antipyrin internally stopped it for forty-eight hours, when it commenced again; the perchloride of iron was of no service, etc. Zoege Von Manteuffel later learned that the boy was a member of a hæmophilic family, and that a few years before he had bled for sixteen days after extraction of a tooth. An injection of cocaine was made in three places into the very painful gum preparatory to cauterizing with the thermo-cautery, when the hæmorrhage immediately ceased. It had to be repeated every five to six hours for a time. The author recalls an earlier case where a similar favorable result was obtained, with cocaine in a hæmophilic.—*Deutsche Medicinische Wochenschrift*, No. 28, 1893.

**II. Contribution to the Drainage Question.** By EDVIN ROOS (Tammerfors, Finland). The writer who formerly was assistant at the Surgical Clinic in Helsingfors, and who now has charge of the Tammarfors Hospital (thirty-five beds), is an absolute antagonist of prophylactic drainage of wounds, which he holds should be entirely rejected. The rubber drainage tube is wholly unnecessary, for, if infection of the wound occur, the tube is soon stopped up with coagulated products, thus acting as a cork instead of a safety valve. He who would have assurance against infection should rather tamponade the wound with iodoform gauze and secure eventual union by the

secondary suture. He has performed ninety important operations without drainage, among which were four amputations of the thigh, three strumectomies, six extirpations of lymphatic glands, five operations for hernia after Bassini, and one castration. In all these operations the writer has used no other covering than iodoformized collodion over the line of sutures. In other operations he has also sutured without a drainage tube, but only applied an ordinary aseptic bandage, as for example, in five removals of the mamma, with extirpation of the axillary glands, in three resections of the knee, two of the hip-joint, in three amputations of the leg, etc. In none of these did infection of the wound take place. In a few cases of extirpation of tumors of the neck, and in two cases of amputation of the breast, it happened that a collection of sero-sanguinolent fluid burst the sutures and collodion in places and evacuated itself. He immediately applied an aseptic dressing, and the wound was found always definitely healed at its removal, eight to ten days after. The writer gives a curious picture of the conditions under which he is obliged to work, having no assistance but two nurses, and in a low building which was never intended as a hospital, and where septic and aseptic cases lie side by side. His operating room is so small that if he wishes to go from one side of the table to the other there is but one way—under the table—and, at the same time, this room serves as a reception room and office. If one can obtain such favorable results without drainage, and under such circumstances, how superfluous drainage must be in well-arranged hospitals.—*Finska Läkaresällskapets Handlingar*, No. 1, 1893.

FRANK H. PRITCHARD (Norwalk, O.).

**III. Disturbances in the Growth of Young Sheep and Lambs After Extirpation of the Thyroid Gland.** By VON EISELSBERG (Vienna). From the known fact that in young animals the extirpation of the thyroid causes marked developmental disturbances, Eiselsberg removed the thyroids of young sheep and lambs and observed the disturbances of development which followed. Six months after the operation the lambs weighed respectively four-



teen and ten kilograms, while the control animals weighed thirty-six kilograms. The temperature of the animals operated upon was always one or two degrees lower than that of the normal animals. Besides the smallness of the animals, the form of the skull was peculiar. The fore part of the head was small, and the back part large. The horns did not develop. The bellies were always largely distended. The psychic condition of the animal was that peculiar to cretinism. An autopsy six months after operation showed general marasmus, absence of fat, no myxœdema, no accessory glands, and a calcareous deposit in the aorta. Of two goats operated upon, one showed the same retardation in growth and the same psychic condition. The autopsy showed no new glands. The other grew big and strong; and at the autopsy a large accessory thyroid gland was found in the aperture of the thorax.

The author refers to the changes which follow this operation as consisting in a feeble growth, associated with idiocy. The picture is very like that observed in the Alpine cretins. And as a conclusion, he claims that cretinism, myxœdema and cachexia strumipriva are diseases all dependent on a common ætiological factor—degeneration or absence of the thyroid gland.

He has examined thirteen cretins, and found, as Kocher did, that the thyroid gland might be entirely absent in such cases. He was unable to discover any thyroid in three of these thirteen.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

JAMES P. WARBASSE (Brooklyn).

#### HEAD AND NECK.

**I. Endocranial Myelogenous Tumor of the Skull.** By Prof. J. NICOLAYSEN (Christiania). A man of fifty years had for years suffered from periodic hæmicrania, either upon the right or left side and associated with vertigo, befogged vision and nausea. In March, 1892, he had had pain in his pharynx, under the right jaw and behind the right ear. These disappeared, and after that he

noticed a swelling in the right temple, which continued to grow. He entered the hospital July 21, when he was somewhat dull and had had persistent headache on the right side for the previous three weeks. In the right temporal region there was a tumor of the size of a child's fist, tensely elastic and immovable, but with distinct pulsation. It could be followed up from a hollow in the cranium, and it projected over the margins which were to be made out here and there; these latter were sensitive, especially at the lower borders. The tumor could not be influenced by pressure. No spasms nor paralyzes; facial expression somewhat dull. It was removed by a flap-shaped incision running around it at about one centimetre distant from the margins. The temporal muscle was infiltrated and was removed with its fascia. The tumor was situated outside of the dura mater, which did not seem to be invaded, and only a few spots were scraped. One centimetre of the margins of the bone was removed all around. Hæmorrhage from the diploë was controlled by the thermo-cautery; that from the dura by iodoform gauze, the ends being left to hang out of the wound which was sutured. The neoplasm had produced a cavity in the brain of three and a half centimetres depth and four and a half breadth, which was filled with fluid albuminous substance of a yellowish, grayish-white color, and was without a distinct capsule. Microscopically the tumor consisted of closely-packed cells with small and easily-colored nuclei without inter-cellular substance. The wound healed by first intention, and the intra-cranial depression elevated itself spontaneously. He was well, looked more lively, did not complain of dulness, and was discharged as cured August 13.

The writer regards the tumor as a mylogenous sarcoma originating in the diploë and not from the periosteum, in which case there would have been a formation of osteophytes. The growth grew and absorbed the cranial wall, periosteum and temporal muscle and progressed outward. Internally it pushed the brain and its membranes aside, and in spite of this there were but few symptoms of pressure or cerebral symptoms beyond a little mental dulness. The pulsation probably proceeded from elevation of the cerebral mass. Before the

operation it could not with certainty be determined if the brain were infiltrated, but the indications for operation were decided. Unexpectedly the dura was found intact, firm and glistening. He calls attention to the immediate improvement in the patient's mental condition, for he answered questions better and recovered rapidly.—*Norsk Magazin for Lægevidenskaben*, pp. 1217-1219.

FRANK H. PRITCHARD (Norwalk, Ohio).

## II. **Fistula Colli Congenita.** By Dr. SCHLANGE (Berlin).

The author has presented two very interesting preparations of congenital branchial fistula. One was from the lateral side of the neck and had been extirpated in its entirety. It was lined with cylinder epithelium, resting upon lymphatic tissue, with numerous follicles. Outside of this was a layer of striped muscle fibres running in the direction of the fistula.

The second preparation was that of a fistula from the median line, which ended at the hyoid bone, which could be thoroughly removed only by the resection of a piece of the body of the bone one centimetre broad. The author regards this operation as necessary for a complete cure of median fistulæ, which instead of ending at the hyoid bone pass completely through it.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

## III. **A Method for Obtaining Double Skin Flaps for Plastic Operations.** By Dr. CARL LAUENSTEIN (Hamburg).

In the closing of defects in the cheeks it is necessary either to use flaps covered on one side with epidermis and on the other with mucous membrane or flaps covered on either side with epidermis. The first is almost impossible; the second can be accomplished by the method which Lauenstein has devised. He has reported a case in which he treated a defect of the cheek by a double-sided flap taken from the breast, and he recommends the method which he pursued for such cases in which material for the flap cannot be taken from the face or in which it is not desirable to further disfigure the face.

The patient on whom he operated had carried an epithelioma of the right cheek for sixteen years. He had been operated upon eight and five years before respectively. Lauenstein had done an excision three years before, and repaired the defect in the cheek by means of a flap, after Dieffenbach, from the upper part of the neck. Still the disease continued, and involved the cheek, the upper lip, the nose and lower eyelid. A final and more thorough operation was done. The defect in the nose was repaired by a flap from the left cheek. The defect in the right cheek was so great that food and drink escaped from the opening. To repair this defect with a double flap he proceeded as follows (see figures): The bridge *a* was dissected free, and the flap *b* cut loose on three sides, drawn under *a* and sutured by its end border to the free border of *a*. The defect left by the flap *b* was covered by Thiersch grafts. The pedicle *c* was then cut out in the direction of the neck. After the lateral incisions had been made cutting off the lateral circulation, the pedicle was dissected up from its underlying tissue, so that the circulation was supplied only through the ends. Then the lower attachments of the double flap were gradually cut through until the blood supply for the whole flap was through the upper attachment. This separation was done very gradually, and from time to time and before cutting elastic compression was made in order to observe whether the circulation from above was sufficient. At the end of thirty-nine days the double flap, which was about eight centimetres square, was found to be ready for transplantation, being entirely nourished by the pedicle, which in its narrowest place was three centimetres broad. Fourteen days after the transplantation into the cheek defect the pedicle was cut from the flap. Before severing it, repeated elastic compressions, the longest of which was five hours, had demonstrated that the transplanted flap was firmly healed in its new position.

The flap now closes the defect perfectly. The patient can smoke, blow and masticate perfectly. The result is not perfect from a cosmetic view because the flap is somewhat thicker than the surrounding tissue of the cheek. It could have been made thinner by taking

Fig 1.

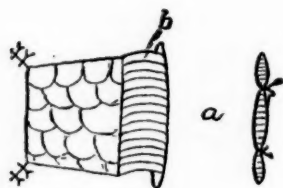
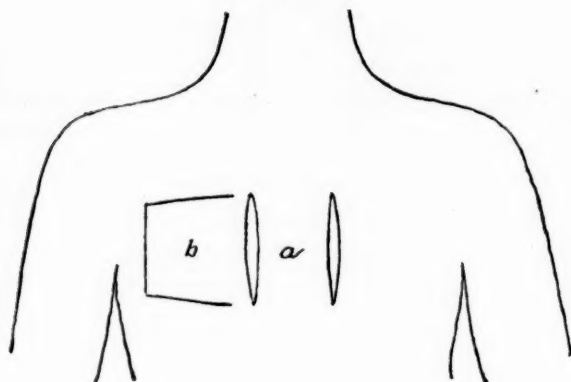


Fig 2.

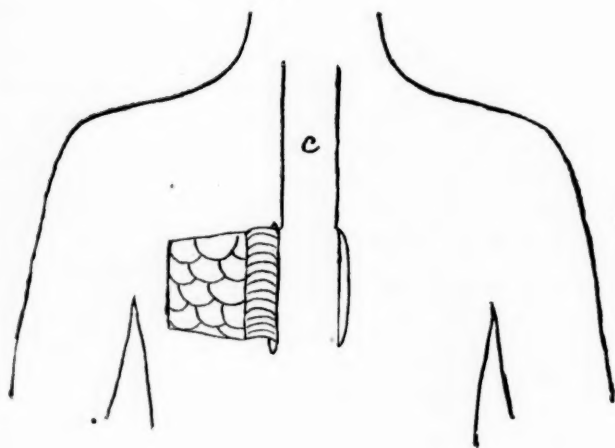


Fig 3.

less subcutaneous tissue.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

**IV. Metastasis of Malignant Tumors of the Thyroid Gland.** By VON EISELSBERG (Vienna). Metastases of malignant tumors of the thyroid occur most frequently in the lungs, and next in frequency in the bones. Von Eiselsberg calls especial attention to that variety of metastatic deposit in the bones in which the secondary growth presents the typical picture of thyroid adenoma, which has been described by Cohnheim, Wölfler, Cramer, Hinterstoisser and others. This tumor has been usually described as metastatic adenoma or malignant adenoma, and also as adeno-carcinoma.

He reports a striking case. A metastasis occurred in the parietal bone, which he removed, leaving a defect in the skull. The large goitre which the patient had caused no especial inconvenience. Four years after the operation recurrence was observed in the same place. Inasmuch as the patient was feeling perfectly well, he refused further operation. Examination of the extirpated nodule showed it to be adenoma with colloid degeneration.

He presented four similar cases. The first was a thyroid adenoma nodule of the skull vault; the second an isolated nodule of the same sort in the upper arm; the third a nodule on the base of the skull, and lastly multiple metastases in the lung, humerus and rib. In every case the primary tumor in the thyroid was so small that it had not been discovered during life. The secondary nodules were all of the type of thyroid adeno-carcinomata.

The peculiarities of these tumors are their localization in the bones, the solitary character of the metastasis, the slow growth, and lastly the frequently very small size of the primary tumor.

The metastases represent the normal thyroid glandular tissue in a very characteristic way. This is quite analogous to the bile-secreting, metastatic nodules with normal liver cells, reported by Perls and Bock in cases of primary carcinoma of the liver.

The clinical character of these metastases is very different from



that of the ordinary metastasis, for in the latter the surgeon sees a contra-indication to operation, whereas these should be operated upon, and by histological examination of the same the seat of the primary disease discovered and possibly extirpated.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

JAMES P. WARBASE (Brooklyn).

#### CHEST AND ABDOMEN.

**I. A Case of Subphrenic Pyothorax.** By H. HOLSTI (Helsingfors, Finland). The writer relates the case of a man of thirty-two years who, formerly suffering from painful attacks, probably due to gall-stones, after he had had for twelve days severe pain in his chest, began to have chills, profuse perspiration, pain in his right side and to expectorate ochre-colored sputa. Upon exploratory puncture of a dull portion at the base of the right lung a serous fluid was obtained; lower down with a short needle also serous fluid, but with a longer needle an ill-smelling fluid of the same consistency as that which the patient expectorated. Resection of the ninth rib in the scapular line on the right side evacuated from the pleural cavity serous exudate. The diaphragm which arched upward toward the field of operation presented a small and fluctuating elevation, which upon exploratory puncture was found to contain badly-smelling pus. The wound was tamponaded with iodoform gauze and in a week, after adhesions had formed between the two portions of the pleura, the fluctuating spot in the diaphragm was incised and a cavity of the size of a plum was discovered filled with the same kind of pus. Later, in the anterior portion of the right side of the thorax quite a large encapsulated pyothorax formed, which was treated by the ordinary operation for empyema, after which the patient recovered. The writer thinks that besides the purulent focus operated upon there must have been others which communicated with the lungs and gave rise to the ochre-colored sputa. He reviews the various and varying methods of operation in subphrenic pyothorax, and recommends his method of procedure;

suturing of the diaphragm to the borders of the wound and immediate incision of the focus instead of waiting for adhesions to form, which in exhausted patients would be dangerous.—*Finska Läkeresäells-kapets Handlingar*, Bd. xxxiv, p. 771.

**II. Tuberculous Stricture of the Intestine; Resection; Recovery.** By CHR. VOELTS (Copenhagen). The writer records the case of a woman of thirty-eight years who had been subject to attack of sharp pain in the abdomen together with vomiting. They would set in suddenly, her abdomen becoming meteorically distended. If flatus could be passed the pains would cease and the seizure be over. As a possible compression of a convolution of intestine was suggested, coeliotomy was done. Adhesions were found in the small pelvis and two strictures were discovered, one ten inches above the ileo-cæcal valve and the other about two yards higher up. The intestinal convolutions were found to be injected and infiltrated with miliary tubercles. The contracted portions were resected, about six to eight centimetres, being extirpated and silk sutures applied. The operation lasted three hours. Forty-five hours later flatus was passed and the patient recovered without accident or reaction. Five months after she was in complete health. In the extirpated portions the intestinal walls were greatly thickened, to six millimetres, especially in the submucous layer, and the villi were swollen out of all proportion. In the peritoneal layer there were circumscribed groups of round cells with epithelioid cells and single phagocytes; tubercle cells were present in small numbers. He does not regard tuberculous stricture as very rare. As an aid to diagnosis he calls attention to the presence in such cases of peculiar, cartilaginous and indurated plates in the peritoneum as well as in the Douglass' fossa. These indurations may grow to actual small exudates when they may be confounded with adherent and deeply-situated ovaries of small size.—*Hospitals Tidende* R. 3, Bd. x, S. 1093.

**III. A Large Piece of Glass Passed Through the Alimentary Tract.** By Dr. E. MUNDT (Rudkjoebing, Denmark).

Mundt reports the case of an eleven-year-old boy who swallowed a square piece of glass, seventeen millimetres each way and with sharp corners. Shortly after he felt a slight scratching pain in the cardiac end of the stomach. A half hour after he received an emetic which brought up a large quantity of gastric contents with half-chewed prunes and pieces of apples just swallowed, but no glass. It could not be felt in the stomach with a gastric sound. The night was passed quietly. The next day he was given three dishes of mush, and after being in the intestines for twenty hours the piece of glass was passed with the first defecation without any pain. He has been well ever since.—*Hospitals Tidende*, No. 9, 1893.

**IV. Mortality from Appendicitis and Perityphlitis in Stockholm.** By C. WALLIS (Stockholm). The writer reports on the cases of death from appendicitis and perityphlitis occurring at the Sabbatsberg Hospital, Stockholm, from 1879 to 1891. His results are:

(1) Appendicitis has during this period formed 1.1 per cent. of all the fatal cases, which is more than double that of the Munich Hospital for 1854 to 1888, where according to Einhorn's investigations it was only .5 per cent. of all the cases.

(2) Appendicitis has been observed to be during this period doubly as frequent a cause in males as in females—1.4 per cent. in males, .8 per cent. in females.

(3) Appendicitis was comparatively frequent as a cause of death between the ages of ten and thirty years; in males it formed 4 per cent. of the fatal cases.

(4) No cases were fatal in males over forty-five, or females over fifty-four years.—*Nordiskt Medicinskt Arkiv.*, N. F. Bd. III, Heft 2, 1893.

FRANK H. PRITCHARD (Norwalk, Ohio).

**V. Non-Parasitic Liver Cysts.** By Dr. W. MÜLLER (Aachen). In contradistinction to echinococcus cysts, the small gall-duct cysts, hæmorrhagic and lymph cysts, Müller has observed a liver

cyst so large as to give clinical symptoms, and which was very probably in genetic relation with the gall-duct system.

The author has operated upon such a cyst, which filled almost the entire abdominal and pelvic cavities and simulated an ovarian tumor. The patient, a cachetic, fifty-nine-year-old woman, had observed the tumor for some ten years. Only during the last year had she suffered serious annoyance from the growth, though for five years it had been a source of discomfort. She complained of frequent micturition, sometimes with retention, pain in the back, abdominal cramps and attacks of weakness. Finally, she became very weak, from, what was later discovered, hæmorrhage into the cyst.

At the operation it was discovered for the first time that the tumor had had its origin in the liver. A thick pedicle attached the tumor to the lower and front surface of the organ. Otherwise the surface of the liver presented a normal appearance.

On account of the very weak condition of the patient, a radical operation was not undertaken. The cyst was widely incised and six litres of chocolate-colored fluid, with much fluid and coagulated blood of various ages, was liberated. From two-thirds to three-fourths of this was evacuated. The remaining tumor was fixed with the pedicle into the abdominal wound. The bleeding was very profuse, and controlled by the cautery and iodoform gauze.

The patient recovered. The wound was healed in four months. The part of the cyst lying outside of the wound was partially uncovered; the rest was cut away. One and one-half years later the patient was well and without recurrence.

Müller is of the opinion that this case, as has been repeatedly observed in animal and human pathology, is one of cystadenoma of the gall-ducts—a benign tumor. — *Verhandlungen der deutschen Gesellschaft für Chirurgie*, xxii Kongress, 1893.

**VI. Extirpation of a Tumor of the Liver.** By E. VON BERGMANN (Berlin). Most operations upon the liver are done for echinococcus, in which a portion of the liver can rarely be removed. Langenbuch removed a lobe in 1888, with good result. Syphiloma

of the liver is most frequently the excuse for removing a portion of the organ. In the early part of this last year Von Eiselsberg removed a large cavernoma of the liver. In a case of carcinoma of the gall-bladder Hochenegg removed the disease, with a neighboring portion of the liver. The largest tumor of the liver ever operated upon with good result was by Lücke.

The tumor operated upon by Von Bergmann was a round, very movable mass, situated on a level with the umbilicus in the middle line. It seemed to be in connection with the liver, and presented the symptoms of an echinococcus of that organ. It was operated upon. Its appearance was liver brown, smooth and of uniform consistency. It was easily drawn out through the wound, and was found attached to the liver by a pedicle ten centimetres long and four centimetres thick. He cut off the pedicle, ligated the larger vessels and controlled the remaining hæmorrhage by pressure with sponges. The tumor was found to be a tubulous gland adenoma (Drüsenschlangadenoma), a variety of tumor closely allied to the primary liver carcinoma and the hyperplastic adenoma. — *Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

**VII. Gall-stone Ileus.** By Dr. W. KÖRTE. Körte has observed four cases of intestinal obstruction from gall-stones. Three were operated upon. Of these, two recovered, and one, aged seventy-two years, died. The patient not operated upon died of peritonitis, which was caused by a stone lodged in the valvula Bauhini.

The stones in the three cases operated upon were demonstrated. Though they were not very large, they were so wedged in the gut that they could neither be moved up nor down. In two cases they were lodged in the lower part of the ileum, in the last cases they were fixed in the flexura iliaca coli. The symptoms in all the cases were very acute, and were not in the least improved by any palliative measures.

In all the cases, by running along the gut the stones were quickly found. The gut was opened by a longitudinal incision, the stones removed and the wound sutured. — *Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

**VIII. Resection of Intestine, in Bergmann's Clinic.**

By DR. HAASLER (Halle). Haasler has presented reports of the intestinal resections which have been done in Bergmann's clinic. Two of these are of special interest.

One was a carcinoma of the ascending colon in a forty-three-years old woman. The growth involved the ileo-cæcal valve, a very little of the ileum, the whole ascending colon and the transverse colon, which was drawn down and firmly involved in the growth. The neighboring retro-peritoneal and the mesenteric lymphatics were also involved. It was therefore necessary to remove about fifteen centimetres of the ileum with its mesentery, the ilio-cæcal valve, cæcum and vermiform appendix, ascending colon, hepatic flexure, half of the transverse colon, and the meso-colon of the above extent. Primary suture was applied. The microscopical examination showed typical adeno-carcinoma. A year after the operation the woman was still free from disease, and had gained thirty-six pounds in weight.

The second case was that of a fourteen-year-old patient who presented the very acute symptoms of an invagination of the ileum. About four weeks later a piece of intestine was passed after severe abdominal pain and with copious blood evacuations. Before and after this time the stools had often been bloody. Six weeks after this the symptoms of stricture of the intestine appeared. Three months after the beginning of the trouble almost complete obstruction, with fæcal vomiting, was present. Resection was performed and the patient completely cured.

On the resected portion of gut, firmly attached to the lower part of the stricture, was a polypoid structure resembling a mucous polyp. Examination showed this to be a remaining part of the cut-off piece of the gut. It was composed of part of the wall of the outer invaginated layer. All of the layers in the thickness of the intestine were found in this polyp. It had rolled up on the serosa so that it gave the impression of a polyp covered with mucous membrane.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

JAMES P. WARBASE (Brooklyn).



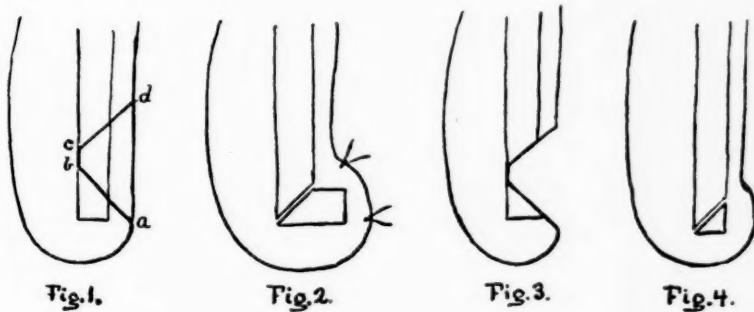
## EXTREMITIES.

**I. The Operative Treatment of a Large Myelogenous Sarcoma of the Tibia.** By DR. NEUMANN (Halle). A patient suffering from sarcoma of the upper end of the tibia was operated upon by Professor Von Bramann. The growth involved the whole upper extremity of the left tibia, extending to below the tuberosity, so that the only remaining bone was a thin shell on the posterior aspect. The cartilage at the place of attachment of the crucial ligaments was broken through. The operator opened the joint by the curved incision of Bergmann, and removed ten centimetres of the tibia with the skin and soft tissues lying in front of it, and sawed off the articular surface of the femur. In order to make the bones fit upon one another, he sawed off five centimetres of the sound fibula. The portion of fibula still projecting above the tibia was then sharpened to a point which was introduced into a corresponding hole bored in the outer condyle of the femur. This kept the bones in firm apposition. A year later the patient now walks about without any further support than an elevated sole. No recurrence. Microscopic examination of the tumor showed it to be giant cell sarcoma. —*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

**II. The Plastic Improvement of Amputation Stumps of the Leg.** By DR. A. BIER (Kiel). The procedure which he adopts to improve the bearing capacity of long stumps is as follows: A wedge,  $a b c d$  (Fig. 1), is cut out, just above the place of amputation, in the soft parts of the anterior aspect of the leg. The soft parts of the interosseum are also divided on the same level. The point of beginning, the wedge incision  $a$ , lies about an inch above the lower end of the bone—not higher, or the "foot" of the stump would be too long. The wedge is truncated at  $c b$ . This line should be an inch long. After dividing the soft parts, the tibia and fibula are sawed first in the line  $a b$  and then in the line  $c d$ , and the wedge  $a b c d$  of skin, muscle and bone removed. The anterior tibial artery

is twice cut through and ligated; the posterior remains intact. If the operation is carefully done the bridge of periosteum, *c b*, can be preserved. The flap is then turned up as in Fig. 2.

In the case of short stumps the wedge is cut out nearer the end of the bone, and the stump formed as in Figs. 3 and 4. The shortening in this case is very small.



The first method can be carried out in uncomplicated cases, at the time of the original amputation. But the last procedure—and in complicated cases also the first—should be done as a secondary operation after the amputation wound has healed.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

JAMES P. WARBASSE (Brooklyn).

#### GENITO-URINARY ORGANS.

**I. On Suprapubic Cystotomy in Two Stages.** By N. SENN, M.D. (Chicago). The author discusses the difficulties and dangers attaching to suprapubic opening of a bladder the subject of septic cystitis. The wound frequently becomes the seat of sloughing and phlegmonous inflammation in spite of the most rigid precautions. He proposes to avoid this by securing in the incision through the pre-vesical tissues a granulating surface before incising the bladder. He summarizes his propositions as follows:

(1) Necrosis and phlegmonous inflammation of the margins of the wound and the tissues in the pre-vesical space (*cavum Retzii*) not

infrequently occur as complications of suprapubic cystotomy if the operation is performed for affections complicated by septic cystitis.

(2) Suprapubic cystotomy in two stages greatly diminishes, if it does not entirely overcome, this source of danger.

(3) In the first operation the bladder is freely exposed in the usual manner, when the pre-vesical fat is dissected away over a vertical oval space at a point corresponding to the location of the proposed visceral incision, after which the wound is packed with iodoform gauze, and the external dressing is applied in such a manner that it cannot become displaced.

(4) The incision in the bladder and the intravesical operation are postponed until the external wound has become covered with a layer of active granulations, which usually requires from four to six days.

(5) The second operation can be performed with the aid of cocaine, without general anæsthesia.

(6) This modification of suprapubic cystotomy diminishes the immediate risks of the operation, and affords protection against a number of serious *post-operationem* complications.—*The Medical News*, July 1, 1893.

## II. Symphyseotomy in Operations upon the Bladder.

By Dr. WICKHOFF. The recent revival of symphyseotomy in obstetrics has led to renewed interest in it as a procedure intended to facilitate certain operations upon the bladder. Wickhoff's paper is an anatomical study. Typical symphyseotomy was done in a male cadaver, the bladder being partly filled with water. From the point of reflexion of the peritonæum anteriorly an incision was made directly downward, ending near the internal orifice of the urethra. It was then demonstrated that the interior of the bladder became readily accessible.

According to Wickhoff, the operation is indicated in cases of tumor of the bladder, and in the repair of vesico-vaginal fistulæ after the method of Trendelenburg.

In reviewing Wickhoff's paper, Hinterstoiser (*Centralblatt für Chirurgie*, No. 21, page 463, 1893) says there has never been any question as to the feasibility of performance of this operation of symphyseo-cystotomy. The only question at issue is as to the after treatment and its results. Clinical experience can only determine this. The operation has not as yet been performed.—*Wiener klinische Wochenschrift*, 1893, No. 11.

GEORGE RYERSON FOWLER (Brooklyn).

**III. Tamponade of the Bladder after Suprapubic Incision.** By E. DESNOS (Paris). The writer communicates three cases of suprapubic incision of the bladder where tamponade of the bladder was necessary in the after treatment. The interior of the viscus was filled with strips of iodoform gauze, one end of each being left hanging out. The upper portion of the vesical wound was closed by one or two sutures. In one of the writer's cases this procedure was done on account of extensive tuberculous ulceration of the mucous membrane. The bladder remained open about a year, when the fistula was stitched up. The patient was freed from his disease, and remains in excellent health. In the second and third cases tamponade was done with salol gauze on account of uncontrollable hæmorrhage following extirpation of a tumor. In both patients it brought a successful result. Tamponade of the bladder causes no inconvenience in passing urine, for the urine flows away through the drainage tubes, and the dressing is but little soiled. The first strips were removed in four to six days.—*Annales des Maladies des Organes Genito-Urinaires*, Bd. XI, Hft. 1.

**IV. Tuberculosis of the Prostate.** By G. MARWEDEL (Heidelberg). The writer attempts to further develop the clinical picture of tuberculosis of the prostate gland. The preceding literature only contains extremely scattering and fragmentary notices on this affection. Four selected observations from Czerny's clinic form the basis of the study. The pathological anatomy of the disease has been well studied, but the symptom picture has been neglected. He

claims that a third of the cases may run their course without presenting any symptoms, otherwise the first signs are those of a catarrhal prostatitis with slight irritation of the bladder. Then there is a purulent discharge and pollutions with bloody diarrhoea. Later an abscess develops with fever, the pus breaking through into the urethra, bladder or rectum, and followed by fistulæ. Palpation of the gland rarely gives certain signs. Isolated disease of this gland is extremely rare, at least the process extends very early into the bladder, seminal vesicles and testicles, and in most cases it may be questionable where the primary seat was. Therapeutically, iodoform is warmly recommended, injected as an emulsion into the bladder. Later the abscess may be incised from the perineum, with an eventual prostatotomy with a slightly arcuate incision and removal of the caseous and necrotic portions with the dull curette.—*Beiträge zur klinischen Chirurgie*, Bd. ix.

**V. A Case of Stone in the Bladder Having a Ligature Knot as its Nucleus.** By OTTO MANKIEWICZ (Berlin). A woman of forty-eight years suffered from myomata of the uterus, for which the uterus, ovaries and tubes were extirpated. She recovered from this operation without difficulty. In eleven months she passed spontaneously a stone through the urethra of the size of an almond. With this her troubles did not cease, and four months later a lithotripsy was done in two sittings. Besides concrements a silk ligature of seven and a half centimetres in length, twisted and tied, was found. Later other fragments were passed. A portion of the ligature was imbedded in the centre of the large stone. How it penetrated into the bladder is difficult to explain. Possibly the vesical wall was included in the ligature and necrosis followed, or the ligature may have caused an abscess, which, with the ligature, was evacuated into the bladder.—*Berliner klinische Wochenschrift*, No. 2, 1893.

FRANK H. PRITCHARD (Norwalk, Ohio).

**VI. Case of Stone in the Bladder, with a Hair-pin as its Nucleus.**—By G. BIVONA (Naples, Italy). Bivona describes

the case of a sixteen-year-old girl, who fourteen months before had introduced a hair-pin into her urethra which escaped from her grasp and slipped into the bladder. For eleven months she suffered from tenesmus and violent pains, anorexia and emaciation. During the last three months there was incontinence of urine and pain in the depths of the vagina. The pains becoming unbearable she sought medical aid and confessed the cause. One limb of the pin had perforated the vesical wall and was to be felt in the vagina. The urethra was dilated by means of a pair of hæmostatic forceps and a stone found to have formed around the hair-pin of the size of a hen's-egg. It being impossible to grasp it with a lithotripter, suprapubic operation was done. The bent end of the pin projected five millimetres from the stone and was fixed against the pubic arch, while the tips extended into the vesico-vaginal septum, one of them perforating. The operation was difficult as the bladder was not dilatable. The stone was elevated as far up as possible with a catheter and a thread inserted to draw it upward. Permanent catheter and recovery in twenty-six days. The stone, weighing fifty-two grammes, consisted of urates and was hard at the upper end while its lower portion was friable.—*Riforma Medica*, February 13, 1893.

FRANK H. PRITCHARD (Norwalk, Ohio).

**VII. On the Ætiology of Cystitis.** By R. WREDEN (St. Petersburg). The author has made a series of experiments in the clinic of Professor Ratinow, and in the laboratory of Professor Neucky, to determine the ætiology of cystitis. As a result of these experiments he has found that the majority of bladder inflammations are excited by intestinal bacteria, namely, the bacterium coli commune.

His observations have led him to believe that the infection is not by means of infected emboli, as Rovsing supposes, but that it is a direct infection from the intestine to the bladder. Such a direct infection seems very possible in a variety of lesions to the rectum, inasmuch as in the male the rectum and bladder lie against one another for a considerable distance, separated by a rich network of blood-vessels and lymphatics.



The following experiments upon rabbits were carried out, and tend to support this hypothesis:

Hot water or croton oil was injected into the rectum of rabbits, or more frequently a lesion of the epithelium was caused by the use of a platinum wire, which was bent at the end to the form of a short flat hook, in order to prevent perforation. The results obtained were as follows:

(1) Lesions of the mucous membrane of the anus alone have no influence on the bladder.

(2) Every instance of injury to the epithelium of the rectum at the border of the prostate, or higher, was followed by cystitis.

(3) The character and course of the cystitis depended on the degree of injury to the mucous membrane of the rectum, and on the bacteria which caused the inflammation.

(4) In the cases of experimental cystitis there were found in the urine the varieties of bacteria which had previously been identified in the rectum, or which had been introduced into the rectum, as a part of the experiment.

(5) Injury of the rectal epithelium, followed by injection into the rectum of vaseline or oil, will give rise to the microscopic appearance of the same substances in the urinary bladder.

The experiments were carried out exclusively upon male rabbits, for the reasons that in the male the rectum and bladder are in contact for a considerable extent of their surfaces, whereas in the female the uterus lies between them; and also for the reason that in the female it is with the greatest difficulty that the urine can be drawn off without violation of some of the principles of asepsis.

Wreden states that his clinical observations coincide with the conclusions derived from those experiments, and that he will make this line the subject of a more extensive work.—*Centralblatt für Chirurgie*, July 8, 1893.

JAMES P. WARBASSE (Brooklyn).

## TUMORS.

**I. Tumors of the Salivary Glands.** By Dr. NASSE.

The writer has made an exhaustive study of the histology and pathogenesis of the tumors of the parotid salivary glands. Formerly such tumors were thought to be chiefly of epithelial origin, but recently they are regarded as having more of a connective tissue basis. His paper deals with the tumors studied under the following classification:

(1) *Adenomata*.—This variety, four in number, was of a more or less lobulated and glandular structure, surrounded by a tense capsule, closely connected with the glandular tissue, so that at the operation pieces of the gland had to be removed with the tumor. The single lobules are divided into smaller ones by fine fibres of connective tissue. They never contain cartilaginous or jelly-like masses, though now and then one may observe, here and there, cystic spaces, formed by the confluence of single alveoli, and filled with cholesterolin, cellular detritus and blood-pigment, due to hæmorrhages into these spaces. Microscopically, they resemble the normal glandular alveoli: the cells large, polygonal or cubical, never distinctly cylindrical, dark protoplasm, large nucleus, and sharply separated from one another.

(2) *Malignant Tumors*.—This form was represented by four of epithelial and connective tissue origin; one small, round-celled sarcoma, recurrent, adherent to the skin; one malignant growth, doubtful whether sarcoma or carcinoma; and two undoubted carcinomata, with infection of the neighboring glands.

(3) *Benign Connective Tissue Tumors of the Parotid Gland*.—These have a slow growth, are sharply circumscribed, and may also recur: angio-sarcomata, chondromata, myxomata, myxochondromata, fibromata, fibro-sarcomata, cylindromata, endotheliomata and the so-called mixed tumors of the parotid, which, though presenting many forms of tissue, yet belong to the same class and contain transitions between the various kinds of tissues. Twenty-five of his observations were of this category, to which are added seven others of tumors seated near to but not involving the parotid, viz., three of

the submaxillary gland, angio-sarcomata and endotheliomata; one tumor of the ascending ramus of the lower jaw, under the normal mucous membrane; two of the lower lip, and one under the skin of the eye-brows, all of which by their histological structure, formation and relation to their surroundings, are to be placed on the same level as the parotid tumors. These so-called mixed tumors, as a rule, are but loosely connected with the glandular tissue and hence are more easily extirpated. They are by far more frequent than the epithelial forms. The epithelioid cells found under the forms of fibres, cylinders and glandular tubes are probably all of endothelial origin. As these tumors may also appear on other portions of the face, and bear no relation to the parotid gland, it is possible that they have nothing to do with the glandular tissue and are to be regarded as springing from the endothelium. Finally, six tumors of the soft parts of the face and head are described, some of which were probably, and others were certainly, of epithelial origin, and, with the exception of one, were regarded as benign, with their point of departure in the cutaneous glands or hair sacs. — *Archiv für klinische Chirurgie*, Bd. XLIV.

FRANK H. PRITCHARD (Norwalk, Ohio).

#### BONES—JOINTS—ORTHOPÆDIC.

##### I. Treatment of Recent Fractures of the Patella.

By Dr. W. KÖRTE (Berlin). After reporting a number of cases of fracture of the patella treated in the Urban City Hospital, in Berlin, the surgical director, Körte, sums up his conclusions as follows:

Fractures of the patella, with a moderate degree of separation of the fragments, 2 cm., and with not much hæmorrhage into the joint, are best treated by massage and early passive motion. Fractures with pronounced hæmorrhage and a still greater degree of separation should be treated by puncture of the joint and the application of the tendon suture, as recommended by Volkmann. After emptying the joint, a well-curved needle is used to pass a heavy silver wire through the ligamentum patellæ close to the lower margin

of the bone; another similar wire is passed through the quadriceps tendon at its insertion. These two wires are twisted together over an iodoform gauze cushion lying upon the skin over the patella. This procedure he regards as free from danger, as the wire does not penetrate the joint sac.

Bone suturing is to be employed only in cases of compound fracture, where it is always indicated if there is a marked degree of separation; also in old fractures with great loss of function, if the muscle is still in good condition. It is also indicated in cases of refracture occurring soon after the parts have healed, and where an imperfect reunion of the torn ligamentous structures is feared.—*Deutsche medicinische Wochenschrift*, July 13, 1893.

It may be remarked that in the resumé which a surgeon appends to his article on the treatment of fractures of the patella, we have an index to the degree of asepsis which he, in his particular clinic, is able to command.

JAMES P. WARBASSE (Brooklyn).

**II. Spina Bifida.**—By DR. HILDEBRAND (Göttingen). Dr. Hildebrand has made a study of twenty-seven cases of spina bifida. The worst form of this disease which he has observed is that in which all of the posterior structures are cleft—bone, dura, pia, cord and the overlying soft parts. In these cases, as a result of hydrops, a myelocoele develops, in which the pia is protruded backward in the form of a sac, so that the inner surface of the pia becomes the outer surface of the sac. Upon this lies the cord as the area medullo-vasculosa. At the place where the spinal cord is inserted within is observed a depression in the sac.

The next form which he describes is that in which the cord, pia, and arachnoid remain closed, but the dura and bone are cleft. In these cases, when the hydrops is in the cord, myelocystocoele results; when it is between pia and arachnoid, meningocele occurs. The last form is that in which the cord, pia, arachnoid and dura are closed; only the bone being cleft. In this either dura and arachnoid form the covering of the sac, or only the dura alone; which ever is the case, the tumor is a meningocele.

The predecessors of Recklinghausen believed that in all cases of rachiochisis only the bone was cleft. Recklinghausen himself was of the opinion that the cleft involved at least the bone and the dura. Hildebrand now shows that the defect may involve the bone, the meninges or the cord, stopping anywhere from the first to the last.

Upon the ground of these anatomic differences he calls attention to the clinical appearances of the different forms and their differential diagnosis. In the unopened sac it is often difficult to distinguish between a meningocele and a myelocystocele. This fact is important because operation is indicated in as much as the knife has to be employed to make the diagnosis. The author excludes from operation cases in which there is any marked degree of paralysis, for this is irreparable. In meningocele the skin should be dissected up from the tumor as far as it is normal, and the sac of the meninges cut off on a level with the spinal column. Any adherent nerves must be protected and finally replaced. The borders of the meninges are then sutured together and the overlying skin with muscle and fascia united across the wound.

In myelocele a lateral transverse incision must be made and the position of the nerves discovered. If they run free through the sac, the area medullo-vasculosa with the nerves should be cut about, replaced in the spinal canal, the sac cut away and its edges sewed together and the skin and fascia sewed over the wound. If the nerves are in the walls of the sac the whole sac must be replaced into the canal and the skin made to cover it. Myelocystocele he treats the same as meningocele. Small cysts need not be operated upon, because they are usually covered with normal skin. When they begin to increase in size, and the skin becomes thin, the skin should be dissected up, the tumor emptied and replaced in its bony channel, and covered with strong skin or a flap of muscle and skin. Hildebrand is of the opinion that when the hydrops has once disappeared it never recurs if normal skin is used to cover the defect. In case of large, bony defect, he recommends after König the covering with a flap of muscle and skin, or an osteoplastic operation. He reports

thirteen cases of spina bifida operated upon in the Göttingen clinic—ten meningocele, and three myelocystocele. Three died from the operation and ten were discharged cured. One of these latter died soon after leaving the clinic. Eight are still living and well. Two of these had myelocystocele; the third with myelocystocele had a recurrence with pronounced hydrocephalus and died three months after operation.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

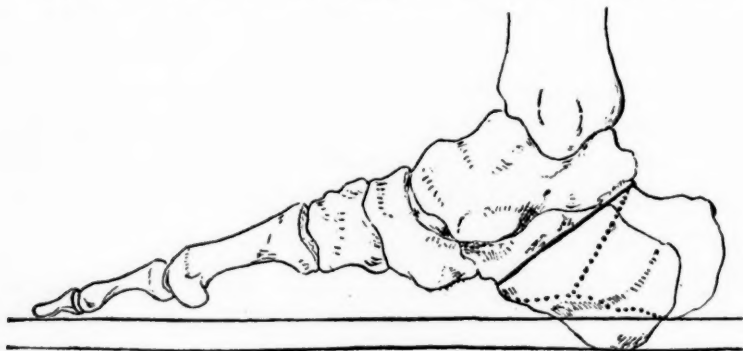
**III. Resection of the Left Hip-joint and Knee-joint in a Delicate Five-year-old Child, Cured.** By Dr. A. KOEHLER (Berlin). The child had had an enlarged knee for two years, and the disease of the hip had been observed for one year. Large abscesses were found in both joints. Both hip-joint and knee-joint were resected at one sitting. Absorbent dressings without splints were applied. Secondary suture with injection of iodoform glycerin was done. In four weeks the wounds had healed with fistulæ. These became closed while the child was allowed to run about in a removable plaster dressing. At the present time, nine months after the operation, the child is well, and runs about the whole day long.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

**IV. Displacement of the Semilunar Cartilages and its Operative Treatment.** By Dr. BORCK (Rostock). Borck reports a case of internal knee lesion belonging to a very rare class, a case with complete tearing across of the cartilage in its substance, that is, with separation of the front from the hinder point of attachment. The patient fell from his horse, striking upon the right foot with the knee bent, and then fell backward to the ground. He complained at once of very severe pain on the inside of the joint. A considerable amount of hæmorrhage took place in the joint. He often felt a body about half the size of a silver dime near the inner border of the patellar ligament, which returned into the joint on the



least pressure. Three months after the accident Borck opened the joint on its inner side. A small amount of clear synovial fluid escaped. On abducting the leg a small body appeared which belonged to the inner meniscus. The anterior third of this cartilage had been separated from its peripheral attachments, and was attached only by its anterior extremity. The operator removed the loose piece of cartilage, and closed the wound. At the end of thirty days the patient was without pain, and left the hospital cured.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXII Kongress, 1893.

**V. The Operative Treatment of Flat-foot.** By Dr. GLEICH (Vienna). Two different views seem to predominate in the operative treatment of flat-foot; the wedge resection of the talo-navicular joint of Ogston, and the supra-malleolar osteotomy of Tren-



delenburg. Ogston seeks for the cause of the trouble in Chopart's joint, and corrects the deformity with ankylosis. Trendelenburg arrives at his conclusion through the pathological anatomical observation that supra-malleolar fractures act as a cure for flat-foot. The advantage of the latter operation is that it does no injury to the elasticity of the arch of the foot.

The author has endeavored to perfect an operation upon the skeleton of the foot, which shall correct the deformity and give rise to no ankylosis. He observed that traumatic flat-foot was due

usually to fracture of the os calcis, and from this fact obtained the key to the operation which he has invented. The operation is as follows:

The calcaneus is sawed through diagonally, somewhat steeper than the section of Günther, and the posterior fragment shoved forward about two centimetres. This lifts the foot about one centimetre, and the angle formed by the calcaneum and the fore-foot is increased. The distance which the heel can thus be shoved forward is, of course, limited; but if it is desired to still more increase the concavity of the arch, the heel can be thrown further toward the perpendicular by excising a narrow wedge instead of making a simple section through the bone. By this procedure the calcaneus is bent upon itself as it were, a condition which exists in the normal foot, but which in the flat-foot is lost. When a wedge resection is done, the effect of the operation can be increased by also shoving the heel forward and downward, as is done in the simple linear section. The technique of the operation is simple. The incision used is the same as that employed in Pirogoff's operation. The calcaneus is exposed, and the operation begun from the lower side. Tenotomy of the tendo-achillis is, of course, done first of all. If it is desired, the weight of the body can be made to come more on the outer side of the foot by carrying the heel slightly inward.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, xxii Kongress, 1893.

JAMES P. WARBASSE (Brooklyn).

**VI. On the Treatment of Club-foot.** By J. PANUM (Copenhagen, Denmark). Panum, out of 148 cases of congenital deformities, found sixty-one cases of club-foot, of which thirty-six were males and twenty-five females. During the weeks immediately following labor, he employs manual reposition, and the foot is placed in a little splint. At the end of the third week a plaster-of-Paris boot is applied, under an anæsthetic; tenotomy is rarely necessary. After a few weeks the boot is renewed, until after a few months the foot is so tractable that it is easily held in position. Then the patient receives a splint applied at night and daily reposition. When

a year shall have passed, he should wear a pair of boots. If the child come under treatment at a later age, tenotomy is necessary, followed by reposition and application of a plaster boot, which is changed every three or four weeks until the foot is in its proper position; after that a boot with a stiff ankle and upper, together with a thick sole. In twelve patients Phelps' operation was done with good results, yet in a majority of them the club-foot altered to a splayed foot; only one of the patients was an adult. In extreme degrees of club-foot, as in adults, the writer is inclined to order a well-formed boot, as the results of operation upon the bones here are not encouraging, and as the majority of such patients walk quite well.—*Ugeskrift for Læger*, R. 4, Bd. XXVI, S. 503.

FRANK H. PRITCHARD (Norwalk, Ohio).

#### GYNÆCOLOGICAL.

##### **I. The Technique of Total Extirpation of the Fibromatous Uterus.** By GEORGE M. EDERBOHLS, M.D. (New York).

Place the patient in the lithotomy position.

Thoroughly disinfect the vagina.

Disinfect the uterine cavity, as far as possible in each individual case, by means of superficial curetting and irrigation with 1-2000 sublimate solution.

Pack the uterine cavity moderately full of sublimate gauze, 1-100.

Pack the vagina *tightly* with sublimate gauze, 1-1000.

Make no vaginal incisions; do none of the cutting from below.

Now place the patient in the Trendelenburg posture.

Open the abdomen above the pubis by an incision just large enough to permit of delivery of the entire tumor.

Given a tumor weighing not above four kilogrammes, with healthy tubes and ovaries, proceed as follows:

Eviscerate the tumor.

Circumscribe two peritoneal flaps by two transverse incisions of the peritoneum, one on the anterior, the other on the posterior

surface of the tumor mass, each incision extending from one broad ligament across to the other. These peritoneal flaps should be large enough to easily cover the defect in the pelvic floor left after removal of the uterus.

Strip the peritoneal flaps from the surface of the uterus, carrying the bladder and ureters forward, out of harm's way, with the anterior flap.

Tie the uterine arteries on either side by a subperitoneal mass ligature of catgut, carried well down to, but not into the vagina. The distention of the vagina by the gauze packing makes this an easy matter.

Tie off the broad ligaments, outsides of the tubes and ovaries, by two further catgut ligatures on either side.

Cut out the entire uterus, tubes and ovaries, in one piece, between the ligatures.

Cut short the six ligatures.

Unite the peritoneal flaps by a transverse, running *Lembert* suture of catgut, extending from the stump of one infundibulo-pelvic ligament to that of the other, carefully applied so as to securely close the peritoneal cavity and turn all ligatures down into the vagina.

Close the abdominal wound.

Again place the patient in the lithotomy position.

Remove the gauze packing from the vagina and apply a loose dressing of gauze in such a manner as to drain the supravaginal subperitoneal space.

If the ovaries or tubes present evidences or suspicion of containing infectious material, tie off and remove them the first thing after opening the abdomen.

If the tumor extend above the umbilicus, weighing more than about four kilogrammes, pass a rubber ligature around the cervical part, after stripping back the peritoneal flaps, and amputate the bulk of the tumor. Cauterize the cervical canal with the Pacquelin or a tablet of corrosive sublimate, and remove the cervix in the manner described above.

If multiple fibromata, or intra-ligamentary fibromata, fill the pelvis, make room by enucleating the fibromata most in the way, and proceed as above.

The technique advocated is believed to possess the following advantages :

The danger of infection from the uterus or vagina is entirely avoided or at least minimized.

The uterine arteries are secured with ease and certainty.

The operation is practically bloodless.

The closure of the peritoneum is as perfect as can be made and no foreign body is left in the cavity.

The after-treatment required is practically nil.—*Proceedings of the Pan-American Medical Congress, Author's Abstract.*

**II. Ureteral Fistula After Vaginal Hysterectomy, Resulting Pyonephrosis, Nephrectomy; Recovery.** By Dr. L. PICQUÉ (Paris). The author reports to the Paris Society of Surgery the following case: The patient, a woman, thirty-three years of age, had been subjected to vaginal hysterectomy by M. Richelot for the relief of salpingitis. Recovered from the operation, but with an ureteral fistula. Four months later she came under the reporter's care on account of pyonephrosis on the right side, referable to infection from the injured ureter. Her condition continued to become more urgent, and at the end of two months lumbar nephrectomy was done. The removal of the kidney was done without accident, and the after-course of the healing was without complication. Section of the kidney showed its substance to have become transformed into multiple foci of pus which communicated with each other, while abundant pus escaped when the pedicle was cut. Subsequent examinations show the cure to be permanent and her general health to remain excellent.—*Bull. et Mém. de la Soc. de Chirurg.*, de Paris, 1893, t. XIX, No. 6, p. 429.

**III. The Treatment of Uretero-vaginal Fistula.** By Dr. M. BAZY (Paris). The author presents a critical communication

to the *Société de Chirurgie* of Paris, based upon a case reported to that society by Chaput, in which a uretero-vaginal fistula had been relieved by turning the ureter into the sigmoid flexure of the colon. In Chaput's case the left ureter had been wounded in the course of an incomplete vaginal hysterectomy for the relief of a suppurative salpingitis. The opening into the ureter was at a distance from the bladder, and was surrounded by much indurated tissue. Stimulated by the experimental work of Harvey Reed, reported in the *ANNALS OF SURGERY*, September, 1892, Chaput determined to adopt a similar method in his case, and accordingly operated September 13, 1892, the fistula having existed for one year. The abdominal cavity was opened by a left lateral incision, extending from the middle of Poupart's ligament outward to the anterior superior spine of the ilium, and thence vertically upwards for some distance; then the large intestine having been carried outwards, the posterior peritoneum was incised for a distance of ten centimetres parallel to the insertion of the mesentery of the large intestine along the iliac fossa. By stripping up the peritoneum toward the vertebral column the ureter was sought for, and after some difficulty identified. It was then severed, and its free end inserted into the sigmoid flexure in the following manner:

The orifice of the ureter was placed in contact with the left posterior face of the gut, so that the two organs met at an acute angle, the apex being downward. Then a row of sutures united the serosa along the posterior half circumference of the ureter and the still intact gut. Then the intestine was incised to the extent of and in a direction corresponding to that of the ureteral orifice, and a row of sutures placed so as to unite the mucosa of the two organs over the posterior half of each orifice; the diameter of the lumen of the ureter did not exceed sixty millimetres. Finally, two rows of similar sutures were placed so as to unite anteriorly the mucosa and the serosa respectively. Before closing the belly, the peripheric end of the ureter was ligated with silk, and a drain of salol gauze was introduced so as to drain the cavity that had been stripped up. The



after-healing was uncomplicated. The urine ceased to escape by the vagina, and collected in the rectum without causing any inconvenience to the patient, who gets rid of it three or four times a day by stools of liquid consistence, composed of urine mixed with faecal material. Her health is still perfect four months after the operation. M. Chaput recognized the objection to his procedure in the possibilities of ascending infection that may occur, but thinks that, as long as the flow of urine is free, and the intestinal mucous membrane is healthy, such infection is unlikely. He further adds that if it does supervene, nephrectomy can then be resorted to.

M. Bazy questions whether in this case a more physiological implantation might not have been done, so as to cause the ureter to empty into the bladder itself. He suggests the possibility in some cases of opening the bladder above the pubis, introducing a catheter into the ureter as far as the seat of the fistula and incising the ureter, beginning at its vesical orifice. If the ureter is not completely obliterated, only contracted, a fine strand introduced into its interior will conduct to that portion of the ureter above the stricture. The strictured portion may now be incised, after which the borders of the ureteral incision should be sutured to the borders of the incision in the vesical mucosa, so as to prevent renewed constriction. If the ureter is obliterated, an incision in the known direction of the ureter ought to strike its dilated portion that exists above the fistulous orifice. Should it not be found, the peritoneal cavity above the bladder could be opened, the ureter sought for, freed and implanted into the bladder at the nearest point.

M. Bazy does not reject wholly intestinal implantation of the ureter, but thinks that the method is worthy of trial in cases in which it is desirable to turn the urine away from the bladder, and in cases in which the ureteral fistula is situated high up. If, however, experience shall show that infection of the kidney is inevitable, after such implantations, immediate sacrifice of the kidney should rather be made.

M. Routier, in further discussing this subject, reported a case of

ureteral fistula resulting from injury to the ureter inflicted in the course of a vaginal hysterectomy done for the relief of salpingitis. A plastic operation for its relief failed, and then nephrectomy was done. In the removed kidney three infarcts in the cortical substance were found, together with pus in the pelvis. This operation cured the fistula, but the ureter is still painful.—*Bulletin et Mémoire de la Société de Chirurgie de Paris*, tome XIX, 1893, No. 5, p. 309.

**IV. Uretero-vaginal Fistula Following Vaginal Hysterectomy for Carcinoma.** By L. H. DUNNING, M.D. (Indianapolis). The author reports a case in which a ureter was injured while a carcinomatous nodule, remaining in the folds of the broad ligament after the uterus had been extirpated, was being enucleated. Five weeks later, obstructive symptoms having developed from cicatricial contraction about the ureteral opening, and the patient being morbidly sensitive to the existence of the fistula, the corresponding kidney was removed by a lumbar incision. An uncomplicated recovery followed. A later recurrence of the carcinoma is, however, already discoverable.

The author has collected from literature records of eight cases of this accident, and by personal inquiry has learned of four more in addition to his own. He refers, also, to reports of ten other cases in foreign literature. To these he adds, also, references to twenty-two cases of uretero-vaginal fistula connected with parturition. Of this entire number of cases, in thirty-five, operations for their relief were done; in twelve successful plastic operations were done, one to five operations in individual cases having been required. In eight cases plastic operations were unsuccessful. Seven were relieved by kolpoplexis, some of them after many operations. There were eight cases of lumbar nephrectomy, with one death. In ten cases renal symptoms occurred after the attempt to close the fistula. As the result of a study of the subject the author formulates the following conclusions:

(1) Injury of the ureter during a vaginal hysterectomy is liable to occur in the practice of skilful operators.

(2) It is more likely to occur when there is a broad ligament infiltration, or when there has been parametric inflammation, with adhesions.

(3) Whether the use of forceps and clamps more frequently results in such injury and fistula than when ligatures are employed has not been determined, but such is probable.

(4) In the five new cases the injury did not seem to have an unfavorable influence upon the immediate recovery of the patient. More observations are needed upon this point.

(5) In the case of resulting ureteral fistula, disease of the corresponding kidney is prone, sooner or later, to appear, whether the fistulous opening be into the vagina or upon the surface of the body.

(6) Operations for the closure of uretero-vaginal fistula, so that the urine will have an unobstructed and uninterrupted flow into the bladder, should, in proper cases, be employed.

(7) The operations of Parvin, St. Simon, Bandl, Landau and Gerde have this end in view, and should be employed in suitable cases if the kidney is healthy.

(8) Kolpoplexis, either partial or complete, leaves an artificial receptacle for the urine, walled in by tissue, in which we fear the speedy return of cancer; hence it is of doubtful utility.

(9) Nephrectomy is a justifiable procedure in uretero-vaginal fistula when there is obstruction to a free flow of the urine into the vagina that cannot be overcome by dilatation of the fistulous opening, in case of failure of plastic operations, and when the corresponding kidney is markedly diseased.—*Annals of Gynecology and Pediatrics*, August, 1893.

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## REPORT OF A CASE OF ANTHRAX.<sup>1</sup>

By HERBERT L. BURRELL, M.D.,

OF BOSTON.

SURGEON TO THE BOSTON CITY HOSPITAL; INSTRUCTOR IN CLINICAL SURGERY, HARVARD UNIVERSITY.

ON February 12, 1892, a man, aged forty-four years, came to the Surgical Out-patient Department of the Boston City Hospital. Dr. G. H. Monks made the diagnosis of charbon on the left side of the patient's neck. The patient gave the following history:

Three weeks before entrance, while working as a longshoreman, he had handled foreign hides, but does not remember having or receiving any scratches upon the hands or neck. Five days ago he noticed a "pimple" over the upper part of the left sterno-cleido-mastoid. This was itchy, and toward night became painful. It increased in area, at the end of the second day the neck was considerably swollen. On the third day the neck was swollen down to the clavicle. Since the beginning of the second day the patient has felt miserable. His head has ached; he has been feverish; has been nauseated; and has vomited once. When first seen he complained more of general pains throughout his body than of the local condition of his neck.

He was a man who had apparently been in perfect physical condition previous to this illness. His skin was slightly yellowish; the eyes looked "muddy;" the tongue had a light, white coat; and there was a large swelling which occupied the left side of the neck and extended from the median line in front to the outer edge of the left erector spinæ behind, and from the ear to the base of the neck. This mass consisted of glands; was movable, semi-elastic, and had a elly-like feeling. Planted in the skin covering this mass, one and one-half inches below the ear, was a raised surface the size of a silver dollar and of a purplish red color, the centre of which was black and a quarter of an inch in diameter. About this lay a ring of pustules

<sup>1</sup> Read by title at the meeting of the American Surgical Association, May, 1893.

half an inch wide. The dimensions of the pustule were two by one and a half inches. This raised pustulo-vesicular surface was connected with an underlying, movable, indurated mass the size of a small lemon.

After some thought it was decided to wait twenty-four hours to see if the patient was growing better or worse. The inflammation in the neck at this time had existed for five days; the diagnosis was not absolutely certain, and the amount of glandular infiltration was so great as to require a more extensive operation than one would undertake for a less serious disease, and if it were not anthrax it might be hoped that the inflammation had reached a limit and that the patient would be better on the next day.

Eighteen hours later he was seen, and it was found that he was worse. The pustular area had not materially increased, but the glandular swelling of his neck had increased and extended, and there was a large area of glandular swelling extending on to the sternum and the left side of the chest. The whole left side of the neck and area over the sternum was covered by an erythematous blush. He said that he had had intense pain in the head since last evening; temperature  $101^{\circ}$  F. It was decided to interfere immediately with the pustule.

The patient was etherized, and as rapidly as possible the whole lemon-sized, indurated, inflammatory mass was excised, care being taken that the pustule did not contaminate the freshly wounded area. This left a circular hole three and a quarter inches in diameter and an inch and a half in depth. The vessels were secured; it was irrigated out with corrosive sublimate, 1 : 1000, dusted with iodoform, and packed with iodoform gauze. The patient made a good recovery from the ether, but the shock of the operation was so great that active stimulation was necessary. On the next day the patient felt much better, and his headache was all gone; temperature was  $101^{\circ}$  F. The erythema had entirely disappeared, and the glands over the sternum and left side of the chest had subsided. Four days after operation the greater part of the glandular enlargement of the neck had disappeared. From the eighth to the sixteenth day of the disease the patient had diarrhoea, and it is questionable whether it was not colliquative. For five days after operation the patient had to be catheterized, and the amount of urine was less than one-half the normal quantity.

On the ninth day the temperature became normal, and from that

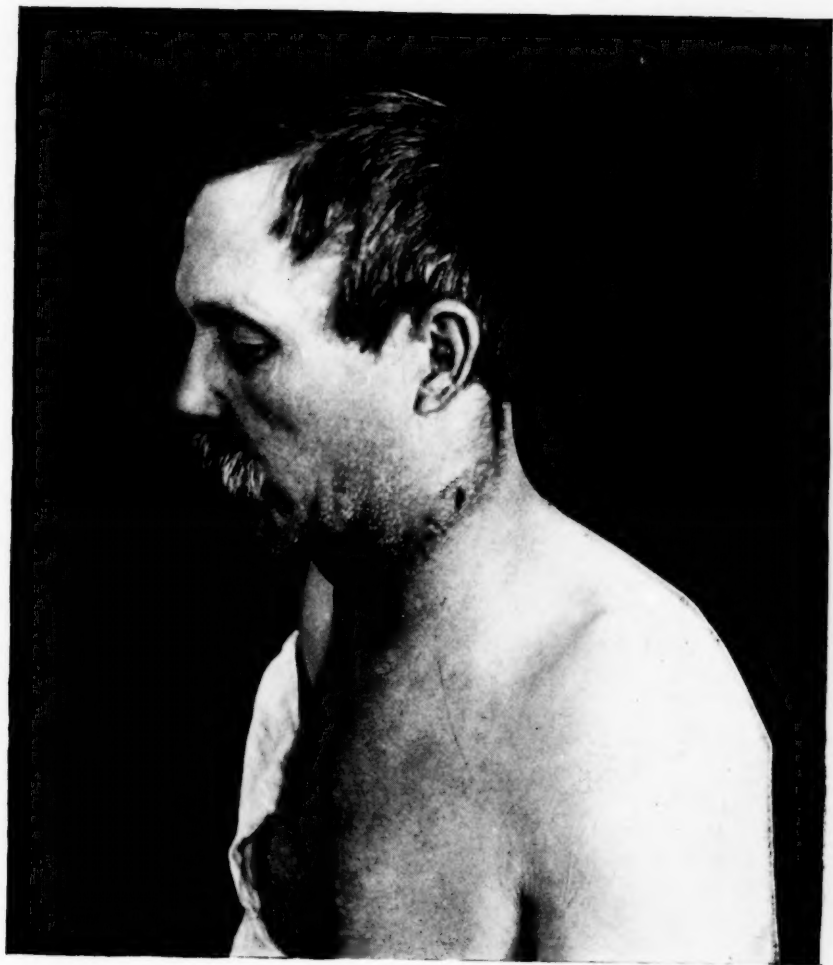
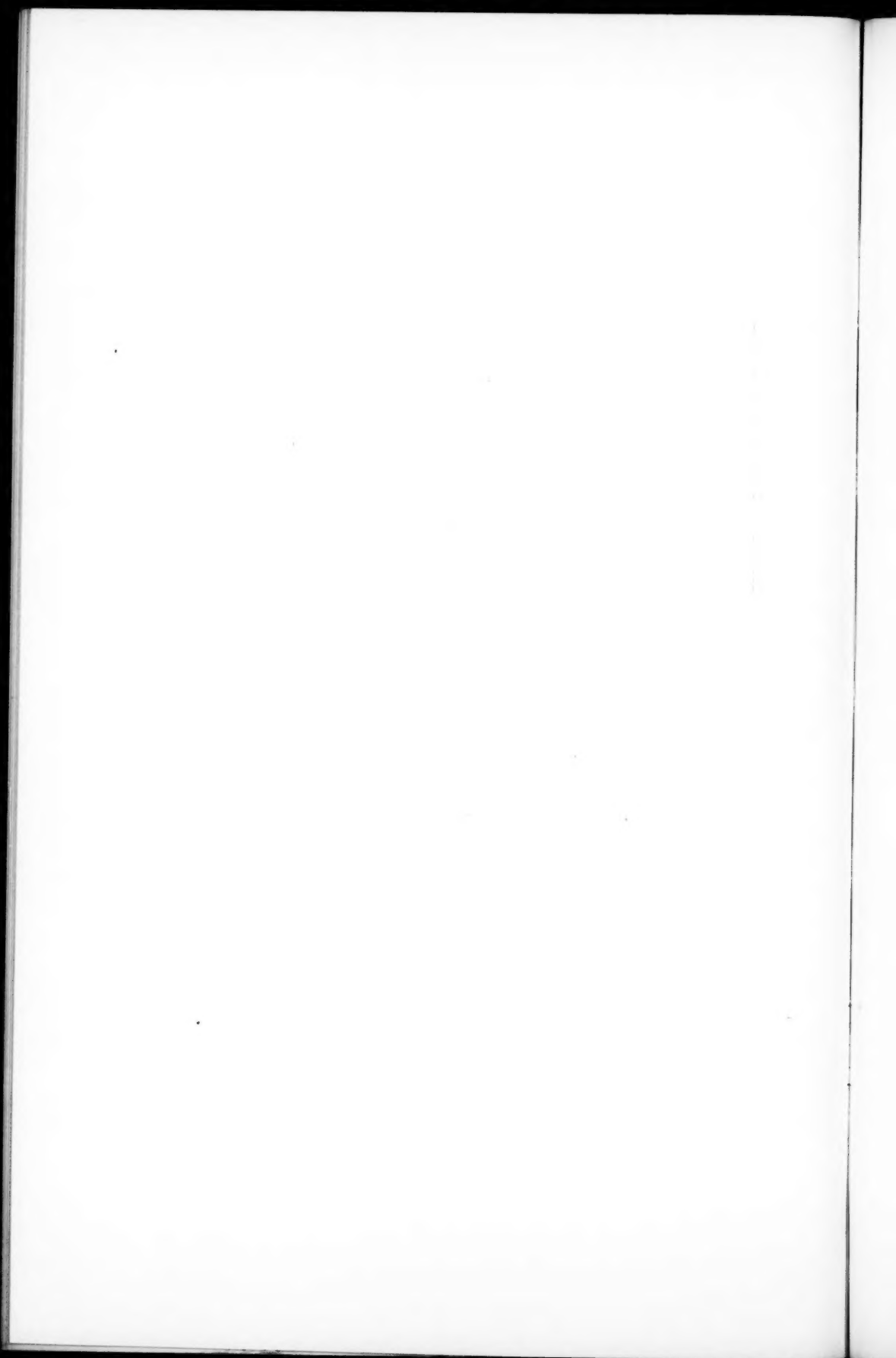


FIG. 1.—A case of Anthrax.





time on there was no material rise in temperature. From the time of the operation on the sixth day to the twentieth day stimulants and nourishment were pressed. The deep circular hole did well, gradually filling with granulations, and was completely closed in sixty days after the operation. There is now a line of cicatrix two inches in length and a quarter of an inch in width running parallel with the left sterno-cleido-mastoid. It is attached to the underlying structures, and there is no sensation in the skin over the angle of the inferior maxilla. On trying to lift with the left arm there is some pain in the neck, which runs down the course of the median nerve. This does not interfere with his occupation.

Just before the operation Mr. Greenleaf R. Tucker, the chemist of the Boston City Hospital, made cultures of the fresh blood flowing from the wound. His report is as follows:

*Bacteriological Report.*—The following is a brief account of the anthrax bacillus and of the identification of the organism in the case of F. H., admitted to the Boston City Hospital February 12, 1892, with the provisional diagnosis of malignant pustule:

The anthrax bacillus is a comparatively large organism, readily seen in blood or in tissues containing it, with an objective of moderate power. It multiplies rapidly upon nutrient media at the ordinary temperature of the laboratory; Upon nutrient agar agar it grows rapidly, spreading out from the inoculation line over the whole surface, furnishing by its growth a mucilaginous product, not, however, especially characteristic. But in nutrient gelatin, if it be not too concentrated, and if the proper conditions are maintained, there appear somewhere along the inoculation line minute hair-like filaments, gradually increasing in number until the entire line is complete with them. They make their way progressively through the gelatin in a lateral direction until they meet with opposition in the sides of the tube. On longer standing the gelatin completely liquefies, resulting in a clear yellowish-brown liquid, while the products of the decomposition of the gelatin by the organism settle out. When perfectly developed, and before liquefaction sets in, the culture presents a highly characteristic feather-like appearance. Finally, the organism produces death in animals susceptible to its influence in from twenty-four to forty-eight hours.

All the above conditions were obtained by an organism fur-

nished by the serous fluid obtained from vesicles located upon the neck of F. H.

The organism was the bacillus anthracis, the cause of the disease known as malignant pustule. The various steps leading to the identification of the organism, and other incidental facts, are as follows:

The neck of the patient was carefully washed with a solution of corrosive sublimate 1:1000, followed by alcohol, after which several vesicles were punctured with a sterilized platinum wire, and the serum thus obtained was inoculated directly upon nutrient agar agar and into nutrient gelatin. In two or three cases where a slight flow of blood was caused by the puncture, the blood itself was inoculated into tubes of agar agar and of gelatin.

All the agar tubes inoculated with serous fluid furnished luxuriant growths, not differing materially from the growth of anthrax upon agar. None of the inoculations upon agar with blood from the vesicles furnished any indications of development even upon long standing; and none of the inoculations in gelatin, either with serum or with blood, showed the slightest evidence of growth. Furthermore, at the time the pustule was removed by operation, cultures were made from the blood flowing from the wound. These blood cultures also remained perfectly sterile. In view of the results I obtained later, which furnished proof of the presence of the anthrax bacillus in the serous fluid, two things became evident:

(1) That there must have been associated with the anthrax bacillus other organisms, or some substance not an organism, which, while permitting the development of anthrax upon agar, entirely inhibited its growth in gelatin, permitting the deduction that it might also in the same manner inhibit its growth in the tissues of the patient.

(2) That in the particular and minute quantity of blood which was inoculated upon agar and into gelatin no anthrax bacilli were present, since, if present, it would have developed in gelatin or upon agar, thereby furnishing evidence for the belief that no anthrax bacilli were present in the blood of the patient.

From one of the original serum cultures upon agar gelatin-plate cultures were made, with the hope that, under the more favorable conditions of the "plate," development would ensue, and thus make it possible to obtain pure colonies of such organisms as might be present. Although the first, second, third and fourth attenuations were

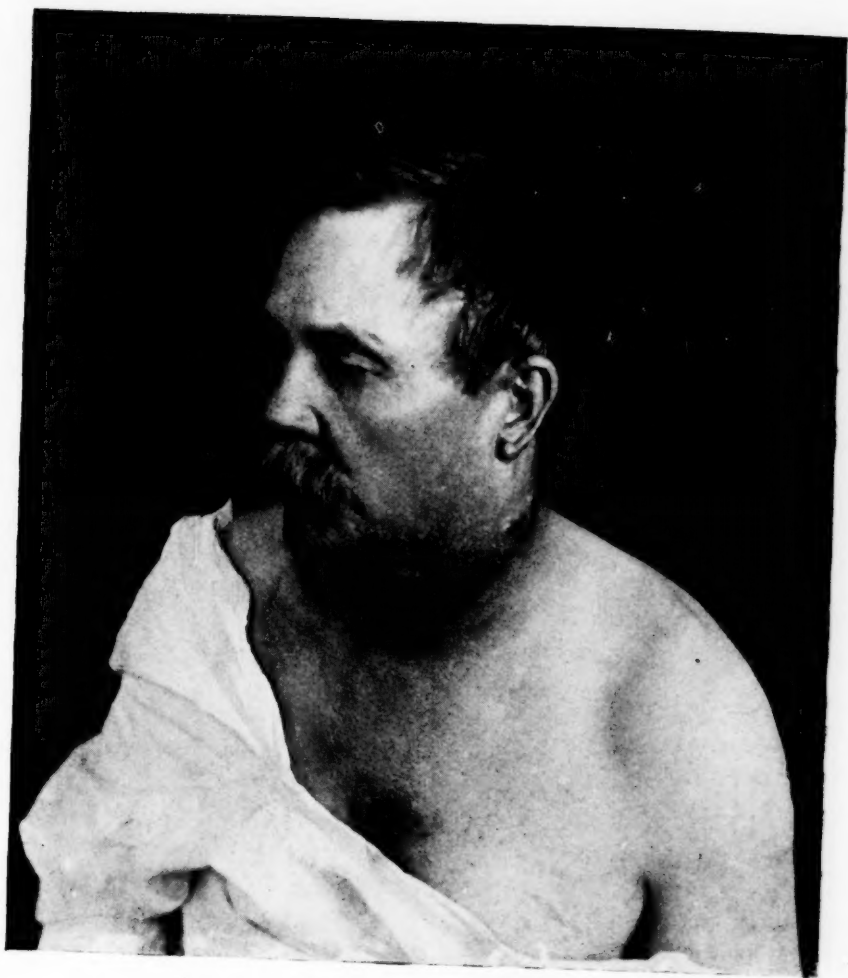
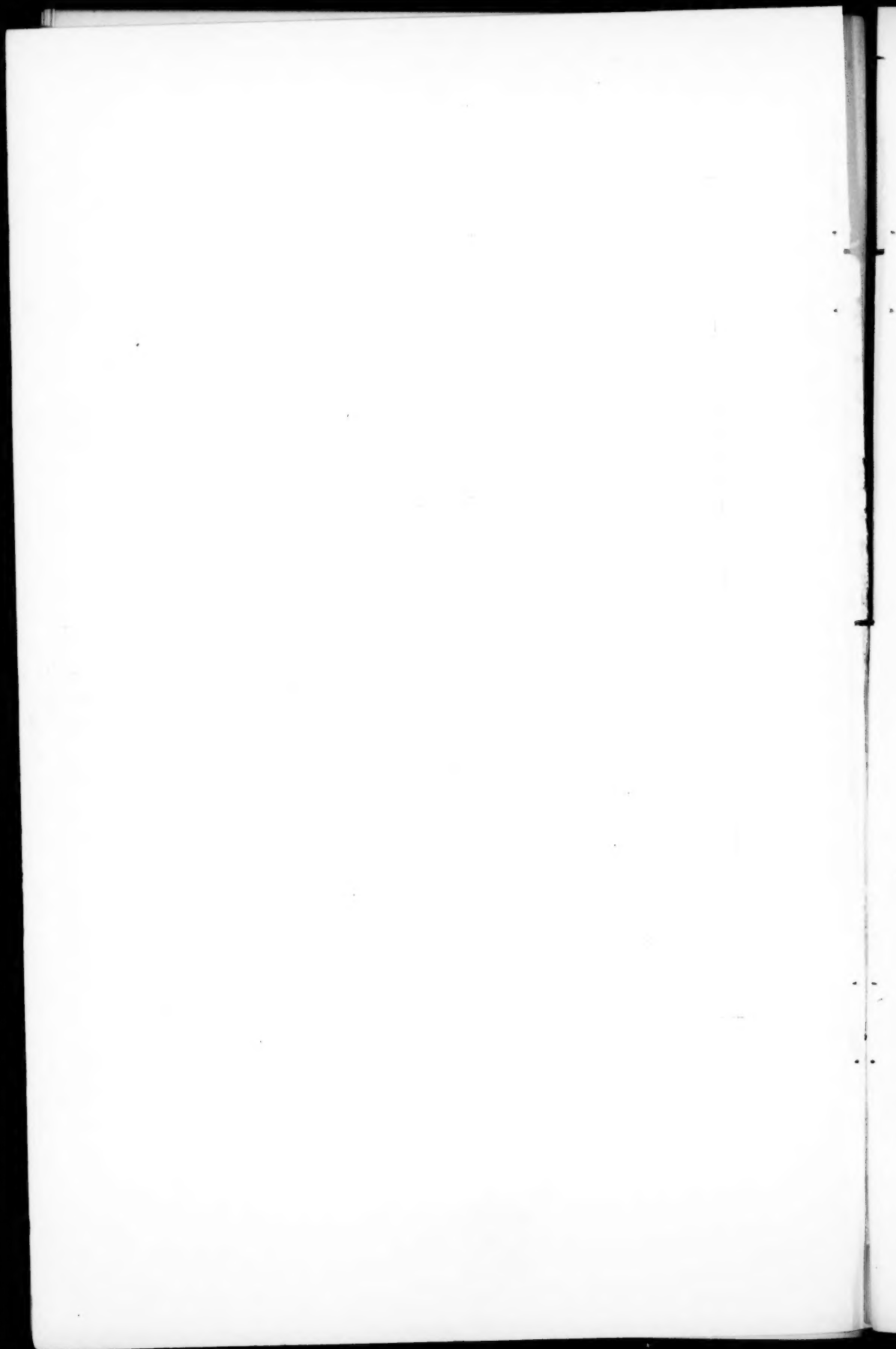


FIG. 2.—A case of Anthrax.



plated, not the slightest indication of development took place after remaining in the moist chamber for weeks. This confirms the statement made above, that there must have been something present in the culture which entirely prevented the development of the anthrax bacillus upon gelatin.

An abrasion was made at the base of the tail of a mouse, into which a small amount of an agar culture was transferred by means of a platinum wire. The mouse took every means at its command to rid itself of the inconvenience of the treatment, and with apparent success, for no sickness was evident after four days' confinement, at which time the animal was killed by other means.

A second mouse was inoculated with a portion of the same culture diluted with sterilized water, and introduced subcutaneously. The animal died in three days, and on removal the viscera were found soft and pulpy, much engorged, and the spleen enlarged. A microscopic examination of the blood showed myriads of bacilli. From all the organs cultures were made upon agar agar and gelatin. Those made upon agar developed only slightly, owing, doubtless, to the use of agar which had been prepared for a special purpose without the usual addition of meat-juice and peptone.

The gelatin cultures all showed a strong growth along the line of inoculation, and eventually liquefied completely, without, however, previously showing the characteristic anthrax development. Small pieces of the viscera were thrown into tubes of gelatin, previously melted, and the gelatin again solidified by cooling. In three tubes appeared thread-like ramifications distinctly like the anthrax growth, but without the regularity of a line culture. This was especially noticeable in the tube containing the piece of kidney.

A small quantity of the blood of this second mouse was at once inoculated into a guinea-pig. The pig died in almost precisely twenty-four hours, no sickness being apparent until about three hours before death. The microscope revealed myriads of bacilli in the blood. Culture upon agar did not develop, owing, again, to the lack of nutritive material. Culture in gelatin, however, developed quickly and strongly, but without the feather-like appearance of anthrax. The gelatin soon liquefied.

Blood from the first guinea-pig was inoculated into a second guinea-pig, and again death took place in almost precisely twenty-four hours, and under the same conditions. The blood was examined, cultures were made upon agar and gelatin, and with the same



result as furnished by guinea-pig No. 1, except for the important difference furnished by the gelatin culture from the kidney and lung, which presented in the most perfect manner the characteristic feathery growth of anthrax. As the culture from the kidney of each animal was in all cases the most characteristic, an inoculation of the urine, which was smoky, of guinea-pig No. 2 was made into gelatin. It remained sterile.

The published descriptions of the growth of the anthrax bacillus state that the feathery appearance of anthrax in gelatin is best obtained by the use of nutrient gelatin containing 8 per cent. of gelatin. The gelatin used by me was 15 per cent., and out of many cultures made but two were satisfactory, and even on diluting this gelatin with sterilized distilled water, furnishing tubes varying in gelatin contents from 5 to 10 per cent., the desired growths were not again obtained. The difficulty is probably wholly a mechanical or manipulative one, but an obstacle which stands in the way of the ready and certain identification of the anthrax bacillus.

The filaments which shoot out from the inoculation line are fine and tender, and a heavy gelatin naturally retards or wholly prevents their proper development. The anthrax bacillus is also an aërobic organism, so that a permanent inoculation line becomes desirable. Such a line is obtained by the use of a moderately firm gelatin and a needle of large rather than small diameter.

The tubes of low gelatin percentage favorable to the formation of filaments are unfavorable to a permanent inoculation line, a slight rise in temperature being almost sure to nearly or wholly obliterate it.

Immediately after removal of the malignant pustule I took the mass to Dr. Mallory, Assistant Pathologist of the Boston City Hospital, and requested him to ask Dr. Jackson to make a bacteriological examination of the growth to determine, first, whether all the malignant pustule had been removed; and, second, to ascertain, if possible, at what points in the mass the greatest and smallest number of bacilli existed. The pathological report of Dr. Mallory and the bacteriological report of Dr. Jackson will follow.

The following is the report of Dr. Frank B. Mallory, received on March 9, 1892:

The indurated piece of skin received from Dr. Burrell on February 13, 1892, showed a purplish area about one and one-quarter inches in diameter, consisting of a small, central, brownish-black crust sur-

rounded by vesicles of various sizes. On section the tissue was œdematous, and showed numerous small hæmorrhages. Microscopic examination of the tissue (hardened one week after removal) showed marked round-cell infiltration in the region of the crust; in the same place for a short distance only beneath the epidermis, and to a less extent in and beneath the vesicles, were found numerous characteristic anthrax bacilli. None were found in the deeper tissues beneath the epidermis surrounding the pustule, or in the blood present in the blood-vessels.

A guinea-pig inoculated by Dr. Jackson with serum from the vesicles died in two and one-half days. Anthrax bacilli in enormous numbers were found in the blood, lungs, liver and spleen.

Diagnosis, malignant pustule.

The following is the report of Dr. Henry Jackson, Physician to Out-patients of the Boston City Hospital:

On February 13, 1892, at 3 P.M., I received a specimen of skin which had been removed from the side of the neck of a man at the Boston City Hospital by Dr. Burrell. The skin on the edge of the specimen appeared normal; in the centre of the specimen there was a deep, bluish, dry excoriation; surrounding this excoriation were numerous vesicles filled with a clear serum. The tissue underlying the vesicles was of a dull, bluish-red color, as if it were filled with blood.

I made cover-glass preparations from the contents of one of the vesicles, and from the deepest part of a fresh cut made in the under surface of the specimen. These specimens I stained with fuchsin. In the preparation from the vesicle were numerous large rods; the preparation from the deeper tissue showed no rods.

One rabbit and one guinea-pig were inoculated subcutaneously from the fresh cut made in the under surface of the specimen. As I found so few bacilli in the preparations made from the deeper structures of the skin, I inoculated the guinea-pig on February 14 from a vesicle. On February 15 there was some swelling about the point of inoculation in the guinea-pig, otherwise the animal ate well, and did not appear sick until the afternoon of February 16; then the animal was very quiet and did not eat. February 17 the guinea-pig was found dead.

*Autopsy.*—Four cultures made from the heart blood.

Cover-glass preparations made from the heart blood, liver and spleen contained an enormous number of large bacilli like the bacilli of anthrax. Spleen much swollen, dark red, soft; liver, lungs and kidney engorged with blood. No hæmorrhages found.

Sections made from the lungs, spleen, liver and kidneys showed an enormous number of bacilli, as found in the blood. In many instances the capillaries were so full of bacilli that the walls had ruptured, and small hæmorrhages had taken place into the surrounding tissue. I found the most satisfactory stain to demonstrate the bacilli in the tissues was the "Weigert fibrine stain."

By this method the bacilli are beautifully stained, and the preceding carmine stain shows finely the anatomical distribution of the bacilli.

*Culture.*—In all the tubes inoculated from the heart blood bacilli of anthrax grew. The characteristic feather-like growth in gelatin was developed in only a few of the gelatin tubes. The cultures were carried on to several generations.

March 10 I made an agar plate-culture from a culture which contained abundant spore formation. After twenty-four hours at 37° C. there were many colonies of anthrax bacilli. No contamination developed.

March 11 I inoculated subcutaneously a guinea-pig from one of the colonies on the agar plate. March 13 the guinea-pig was found dead. The body was still warm. Death occurred in less than forty-eight hours.

*Autopsy.*—The point of inoculation was swollen; no pus; the gland nearest the point of inoculation was swollen and contained several hæmorrhages; spleen enlarged, soft, dark purple. No hæmorrhages in gastro-intestinal tract. Liver and kidneys engorged with blood. Lungs showed numerous small hæmorrhages; in both posterior lobes of the lungs a spot of consolidated tissue about the size of a pea. These spots were hæmorrhagic. Cover-glass preparations made from the heart blood, spleen and liver showed an enormous number of large bacilli. Cultures were made from the heart blood; bacilli of anthrax developed in all the cultures.

*Skin Removed from the Patient.*—I made sections from the skin removed by operation. Many of the sections showed no bacilli, or only a very few. In some of the sections I found a few small areas in which were numerous bacilli. Where found, the bacilli were situated either in the vesicles on the surface or in new-formed granu-

lation tissue surrounding the hair follicles. No bacilli were found in any of the sections in the deeper portion of the tissue removed. Just beneath the skin were numerous small areas of hæmorrhagic infiltration. The outer portion of the tissue, however, showed no abnormal appearance.

The microscopic examination of the tissue removed demonstrated conclusively the wisdom of an early and free excision of the initial lesion of anthrax in the human subject, as no bacilli and no pathological changes were found except just beneath the vesicles evident before excision. In this case, certainly at the time of the operation, the bacilli had not entered the general circulation.

*Résumé.*—Large bacilli were found in the vesicles on the skin removed by operation. A guinea-pig inoculated from a vesicle died in three days, and a microscopic examination showed all the appearance of anthrax. Cultures of anthrax bacilli were made from the first guinea-pig.

After one month a second guinea-pig was inoculated with a culture which had been carried on for several generations. The second guinea-pig died in two days with the characteristic lesion of anthrax. Anthrax bacilli were cultivated from the second guinea-pig. (The rabbit inoculated from the original skin on February 13 remained well, and was accidentally killed three weeks after operation.)

From data given in the *résumé* the diagnosis is made of anthrax, malignant pustule, in the specimen of skin.

#### REMARKS.

During the past five years a new history of this disease is to be recorded. The literature of the subject may be considered under the following headings:

- (1) The localization of the anthrax bacillus.
- (2) Internal anthrax.
- (3) The diagnosis of charbon.
- (4) Immunity by inoculation.
- (5) Prophylaxis.
- (6) The treatment by the injection of other organisms.
- (7) The radical treatment which has come forward with the advent of antiseptics.

*The Localization of the Anthrax Bacillus.*—The best observers differ as to the presence or absence of the anthrax bacillus in the blood. In some cases where they are found in the various organs far removed from the initial lesion they have not been detected in the blood by the most thorough search. (1) The explanation probably lies in the fact, which appears to have been clearly demonstrated, that the anthrax spores are disseminated through the system by the blood, so that almost any part of the organism may be used as a source of culture even when no bacilli have been found except in the neighborhood of the local lesion. (2) The diffusion of the spores is, however, not inconsistent with the theory of radical local treatment, as the local colony of bacilli are presumably the manufactory of the spores found in other parts of the body.

*Internal Anthrax.*—The cases in which the lesion is absent altogether, or occurs in a more or less modified form internally, are few, but they are extremely interesting from the difficulty and importance of diagnosis. The most striking cases with which I am acquainted are :

(1) The case of a man in which the attack began suddenly with swelling under the tongue, headache, fever and delirium, and later bloody stools and bloody vomitus appeared, and great dyspnoea. Death occurred on the fourth day (3).

(2) A baby five months old, supposed to have a severe bronchitis. The chest yielded all the physical signs of bronchitis, but in addition there was some general oedema, and an erythematous patch upon the upper left chest. After death, on the ninth day, the "pustules" were found in the bronchi. (4)

(3) A case has been recently reported in which a diagnosis of intestinal obstruction was made by competent surgeons. The patient was so nearly moribund that an operation was not attempted. The autopsy showed great congestion of the intestines; the mesenteric glands were greatly enlarged. (5) In this case the bacilli were abundant in the blood, one loop of intestine was very much swollen, and a thrombus twenty centimetres long was found in the immediate neighborhood.

(4) From the four cases reported by Massing, it appears that vomiting, diarrhoea and extreme constipation may or may not

be present in abdominal anthrax, and that all the symptoms are uncertain. (6)

Even where there is an external lesion the diagnosis may be far from simple. The great variety which the local manifestation may assume is shown in the accompanying analysis of the forms of lesion by Sabatier: (7)

## CLASSIFICATION OF SABATIER.

Charbons externes	Formes papuleuses.	Pustule malignant de millet.
	Formes phlyctenoides.	{ Pustule malignant classique. Pustule à œdème séparé. Observation personnel.
	Formes œdémateuses.	{ Œdème malin charbonneux bourgeois d'Etampes.
	Pénétration par.	{ Plaie carbonisée. Admise par Roscol, sont à reviser. Point gangreneux sans phlyctene. Absorption par une muqueuse.
Charbons internes	Charbon malin.	{ Avec tumeur symptomatique. Forme œdémateuse. Observation de Mauverzin, 2.
	Fièvre charconneuse,	{ Salmen et Mannaury. Pas de charbons extérieur.
	Mycose intestinale.	
	Forme pulmonaire d'Eppinger.	

And Colin (8) has by experiments on dogs defined clearly ten different forms which the so-called "pustule" may assume.

## CLASSIFICATION OF COLIN. FOUNDED ON EXPERIMENTS UPON DOGS.

(1) A small pustule, incompletely formed, which preserves for several days the virulent material.

(2) A diffuse erythema which lasts for a very short time, and vanishes almost suddenly.

(3) A small malignant pustule, more or less elevated, red,



umbilicated, yielding at first a serous, and later a sero-purulent fluid.

(4) A simple œdema without change in the state of the skin.

(5) A pustule followed by œdema.

(6) An œdema followed by a pustule.

(7) A pustule and an œdema arising at the same time.

(8) A pustule with œdema and erythema.

(9) A phlegmonous tumor.

(10) Finally, a small bubo with lymphangitis in the neighborhood.

*Immunity by Inoculation.*—Woodbridge (9) has obtained immunity from anthrax in animals by the injection of a fluid from which the bacteria after culture have been removed by filtration. The immunity must result from the presence in the fluid of some product of the life of the bacteria.

Hankin (10) has described a distinct chemical substance obtained from the organs of an immune animal—the rat—which possesses the same power.

*Prophylaxis.*—Inoculation with attenuated cultures of the bacilli themselves has also been used with complete success to confer immunity. But the rarity of the disease in man makes it unlikely that such measures will ever become of practical importance to human patients, except indirectly by decreasing the disease among animals (11).

*Treatment by the Injection of Other Organisms.*—One of the most curious phenomena in the natural history of the disease is the antagonism of the bacteria of several other diseases to that of anthrax. The researches of a number of eminent bacteriologists have clearly demonstrated the following principles :

(1) That the diplococcus pneumoniae, the erysipelatos coccus, the staphylococcus pyogenes aureus, the bacillus prodigiosus, and some other forms are hostile to the bacillus of anthrax.

(2) That the growth of anthrax may be retarded or destroyed entirely, according to the quantity of the antagonist injected.

(3) That the injection must be at about the time of infection with anthrax, and that immunity lasts only while the presence of antagonists continues.

(4) The injection of the antagonist may be directly into the circulation, or into the tissues about the pustule. But the first method is no more efficient than the second, and has been followed by death from embolism.

(5) There is danger of death from the antagonist bacillus (12).

*Radical Treatment.*—The methods of radical treatment which claim attention from the success reported may be enumerated as follows :

(1) The old and obvious method by complete excision.

(2) The use of the actual cautery instead of the knife (13).

(3) The destruction of the lesion by the injection of strong solutions of the most energetic antiseptics, carbolic acid and bichloride of mercury (14).

Ever since Jarnorsky's report of seventy-two cases, all cured by local injection of carbolic acid, this principle of treatment has been extensively followed with results which must be regarded as brilliant, even after every allowance has been made for the irresistible tendency not to report unfavorable cases. More than a hundred cases of cure by this method have been reported, and I have no doubt that the number could be greatly increased by a more complete search.

Antiseptics have been applied in two ways, yielding equally good results. A crucial incision is made and the antiseptic applied in a very concentrated form, or a circle of injections of the germicide is made around the pustule. The effect is the same. The whole mass sloughs off, and the final result in the successful cases is about as radical as an excision. The destruction of the whole pustule by the cautery is only another way of producing the same result. In a number of the cases the local use of powerful antiseptics was supplemented by the internal administration of corrosive or carbolic acid in heroic doses. But the result seems to have been quite as good in the large number of cases in which the treatment was purely local. It cannot be

supposed that enough of the germicide could be taken internally to render all the tissues antiseptic, and on no other supposition can the necessity of the internal treatment be justified. (In some cases the antiseptic, though strong, is said not to have caused a slough.) (15)

Another form of treatment may be noticed in passing. The use of electricity has been repeatedly tried, but, on the whole, without good results. And Apostoli's experiments show that its only means of action is by the acid set free at the positive pole, which he finds destroys the bacillus (16). But the method is less thorough, and more difficult of execution, than the other more radical procedures described. Davies-Colley (17) has reported cures by ipecac in large doses internally and locally applied. His treatment was suggested by Muskett's report of (18) fifty cases without a single death, treated by large doses of ipecac.

Evans (19) has tested this treatment by a bacteriological study in which he has shown that ipecac is fatal to the bacilli in cultures. But the treatment has one serious flaw, if we may judge by Evans's results; the spores are not destroyed. As powerful antiseptics the cautery and the knife would destroy all the local spores. They are in this respect more thorough, and to be preferred.

#### CONSIDERATION OF CLINICAL HISTORY; PATHOLOGICAL AND BACTERIOLOGICAL REPORTS, AND LITERATURE OF THE SUBJECT.

The points of interest in this case, as they presented themselves to the writer, are the completeness of the history of infection; the recognition of the disease by Dr. Monks; the severity of the man's illness; the increase of the systemic poisoning upon the sixth day of the disease; the relief which was given the patient by the excision of the pustule; the rapid subsidence of the glandular swelling, and his complete recovery. The reports of Mr. Tucker and Drs. Mallory and Jackson are filled with interesting points, especially when their reports and the clinical history are considered in the light of the literature of the subject.

It was a surprise to the writer to know that the old operation of excision of the pustule had been so far supplanted as it has been by the treatment of injections of corrosive sublimate and carbolic acid. The reports of Davies-Colley and Muskett in reference to ipecac, and the bacteriological study of Evans on ipecac are of great interest.

Mr. Tucker states that in the cultures which were taken from the vesicles there must have been in the serum some living organism, or some substance not an organism which, while it permitted the development of anthrax upon agar, entirely inhibited its growth in gelatin; permitting the deduction that it might also inhibit its growth in the serum or tissue of the patient. This, while advanced by Mr. Tucker as purely a suggestion, is full of interest, especially when we consider the classification of the disease by Sabatier and Colin.

That there are different forms of malignant pustule, all dependent upon the same bacillus, seems probable, but not settled. That this patient should have been inoculated with anthrax, have suffered for six days and yet recovered, is so different from the recorded history of many cases where the patient succumbs to the virulence of the systemic poisoning in from forty-eight to sixty hours, that it would lead us to suspect that the difference in the clinical manifestations may depend upon whether the infection is local or systemic.

Again, the literature of immunity by inoculation which Woodbridge has obtained by the injection of a fluid from which the bacteria after culture had been removed by filtration, and Henkin, where a distinct chemical substance obtained from the organs of an immune animal—the rat—possessed the power of conferring immunity upon the inoculated animal are of interest.

That an antagonistic influence should exist between different bacilli is a matter of congratulation as well as of great interest, and in considering this case the antagonism between the anthrax bacillus and other bacteria must be considered. The absence of the bacilli in the blood is a matter of interest.

From the bacteriological reports of both Mr. Tucker and

Dr. Henry Jackson, the belief may be entertained that systemic poisoning had not occurred, yet the patient presented the appearance of an extremely sick man suffering from systemic poisoning, which systemic poisoning on the sixth day was much greater than upon the fifth day, and for this reason I believe that he was systemically poisoned either by the anthrax bacillus or its products.

The presence of the anthrax bacillus having been proven in this case by three different bacteriological experts places the diagnosis beyond a shadow of doubt. In Dr. Jackson's report there is a statement made of great interest from the operative standpoint. He states that in many of the sections no bacilli existed, or only a very few. In some of the sections he found a few small areas in which were numerous bacilli. Where found the bacilli were situated either in the vesicle on the surface, or in the new-formed granulation tissue surrounding the hair follicles. No bacteria were found in any of the sections in the deeper portion of the tissue removed. Just beneath the skin were numerous small areas of hæmorrhagic infiltration. The outer portion of the tissue, however, showed no abnormal appearance, so that from this report it is fair to deduce that the excision completely removed the nidus of disease, which was situated principally in the skin and about the hair follicles, and it further demonstrates that the removal of a pustule after extensive glandular swelling is not a useless measure.

From a theoretical standpoint it is interesting to speculate as to the reason why this patient did not die from his infection with the anthrax bacillus. That he was systemically poisoned I feel certain, but that this was by the bacillus I do not believe. The opinion is held by many bacteriologists that death in charbon occurs by the crowding of the blood with bacilli, which at times mechanically produce thrombosis of the arteries of the lungs, etc. That this is one method of death cannot be doubted; but we also know that in anthrax, as in other infectious diseases, death occurs by the toxic action of the products of bacteria (ptomaines, toxins, etc.).

If the patient were systemically poisoned by the products.

of the anthrax bacilli, and the local nidus were removed, the patient would probably recover. This may offer an explanation why patients from so fatal a disease recover under radical local treatment.

The application of this reasoning to other diseases, such as diphtheria (20), may by analogy be made, and it is possible that in the future we shall more radically treat areas of local infection which are sources of danger to life from systemic poisoning.

In the light which has been given me by the clinical history of this case, the reports of the bacteriological examination, and the literature of the subject which is at my command, I would make the following deductions in regard to treatment:

(1) That where applicable, the old and obvious method of treatment by complete excision of the pustule, when vital structures are not involved, is the best.

(2) That where extensive surfaces involving vital parts are involved, the treatment by injecting strong solutions of the most energetic antiseptics may be used.

(3) That glandular swelling about the malignant pustule, and apparent systemic poisoning do not contra-indicate operative treatment.

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GUNSHOT WOUNDS OF THE INTESTINES; CLINICAL  
REPORT OF THIRTEEN CASES; REMARKS ON  
THE DIAGNOSIS AND TREATMENT.

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OUR current medical literature abounds in clinical reports of cases of surgical laparotomy in the treatment of gunshot wounds of the intestines, and the wisdom of the operation, under proper conditions, is attested by the increasing proportion of successful results. The guiding principles of all surgical treatment are very simple, and they are universally applicable, at this day, in every province of the human anatomy. The inactive treatment in the management of gunshot wounds of the intestines, pursued in the olden times in the care of all cases, is rapidly becoming obsolete, and the methods of procedure in such cases have been made to conform to the new order of things in modern surgery.

*Diagnosis.*—The diagnosis of intestinal wounds, in most instances, is attended with difficulty. There are no general symptoms which are positively diagnostic, although many constitutional signs may lead us to a conjectural diagnosis. There may be no evidence of shock, even in a case of very grave lesions, as is well shown in Cases X and XI, presented in this report. Again, in some cases, remedial agents may relieve symptoms which otherwise would indicate serious lesions. On the other hand, the fears of patients and the wild play of their emotions may easily mislead one to overestimate the character and the extent of the injury. So, there are many conditions which make the general symptoms inconclusive.

The ordinary local signs are by no means infallible in the precise diagnosis of internal abdominal injuries. Pain in some

part remote from the track of the ball, usually referred to the umbilical region, is a valuable sign, but not positive. The evacuation of blood from the bowel is quite a sure symptom, but it does not occur early enough for our diagnostic purposes. The escape of the intestinal contents from the external wound is a crucial test, but this occurs very rarely. The diagnosis must be made immediately and positively. The most positive means at our command to-day are the hydrogen-gas test and exploratory laparotomy. The inflammable gas test is not always conclusive. Wounds of the intestines may exist and yet escape recognition by this method of diagnosis. Again, the concurrent escape of the intestinal contents with the gas and extravasation in the peritoneal cavity is an accident which may seriously complicate the case. The wounded intestines, as a rule, lie stunned in the cavity, so much so that we have rarely found much extravasation from the intestine in any case. Now, it is very desirable to avoid faecal escape into the serous cavity and hence the necessity of very mature deliberation before adopting any diagnostic means which may prejudice the success of the case.

Exploratory laparotomy offers, in our judgment, the quickest and the safest method of positive diagnosis. The emergency warrants a decisive step. In any case of gunshot wound of the abdomen, one is safe in assuming that the intestines have been injured if the missile, delivered at short range, has penetrated the anatomical regions overlying this part of the alimentary canal, and especially so if the wound is located over the regions occupied by the small intestines. In such cases it has been our custom to follow the parietal wound with a probe so as to verify the entrance into the peritoneal cavity, and then to perform an exploratory laparotomy. The incision is made tentatively and very cautiously for diagnostic purposes. It is enlarged if indicated by conditions existing within and if necessary to facilitate any internal operative work. The exceptional cases in which a bullet may enter the middle and lower regions of the abdomen, without perforating the intestine, are too rare to deter one from the operation through fear that he may perform an unnecessary abdominal section. Only once in follow

ing the rules herein announced have we failed to discover wounds of the intestines in a case of gunshot wound of the abdomen penetrating and transversing the regions occupied by the small bowel. This case recovered.

*Surgical Treatment.*—The diagnosis of a gunshot wound of the intestine having been made, the advisability of active surgical treatment is, at this day, without controversy. The technique in special cases may vary, but the principles of treatment remain the same. Our methods are very simple and the following are the rules usually observed:

(1) The preparation should be as complete as possible so that the surgical work may be done with all possible dispatch. Everybody and everything concerned in the operation should be surgically clean. The risks are minimized by engaging the smallest possible number of assistants. Only sterilized water is allowed, and this is used freely not only for cleansing purposes, but as a means of stimulation during the shock attending the operation.

(2) The median section, whenever practicable, is advocated and this should be sufficiently free to facilitate thorough exploration and all necessary operative work. The operator should be enabled to see what he is doing.

(3) The exploration of the abdominal cavity should be systematic. The intestines should be passed in review from one end to the other, and special examinations should be made of all organs contiguous to the bullet's track.

(4) The vessels should be ligated and all intestinal wounds sutured with sterilized silk. The material can be made aseptic and perfectly innocuous, and it holds more securely than any other. The interrupted Lembert's sutures should be passed in the direction of the longitudinal fibres. This method best obviates contraction of the calibre of the gut.

(5) The peritoneal cavity should be cleansed by hand, by aid of a full stream of hot water poured from a bowl or pitcher. Any amount of clean water or blood remaining does less harm than the irritation caused by sponging the cavity dry. We do not, as a rule, employ sponges or other absorbent material in cleansing the cavity.

(6) The abdominal section should be closed with the silver wire or the silkworm-gut, which gathers up the peritoneum with the main sutures. The superficial structures should be closed by intermediate sutures of material most easy of application, preferably fine silk or the silkworm-gut.

(7) The superficial wound should be dressed with light, aseptic material, the absorbent gauze and cotton being used more generally.

The technique of this operation should not only be perfectly understood, but every detail anticipated and executed with care. In no class of cases, perhaps, does practice so improve the statistics.

All of the cases, herein reported, were treated in the Charity Hospital, at New Orleans, with the assistance of the resident medical staff. Some of them, as stated in their individual history were transported into the city by railroad and were submitted to us for operation under the disadvantages incident to the delay as well as to the risks of travel. The condition of some of these patients at the time of the operation seemed almost desperate. However, whenever the condition of the patient warranted the belief that he would survive the operation, we operated in the conviction that, if alive after the operation, the chances of living would be improved thereby. The following cases are presented in the order of their occurrence, with such comment as the clinical history of each may suggest.

CASE I.—*Gunshot Wound of the Abdomen, with Seven Perforations of the Small Intestines; Laparotomy; Enterorrhaphy; Death.*—W. F. H., white, aged thirty years, was by occupation the driver of a beer wagon and accustomed to drink about thirty glasses of beer every day. He received his wound on March 9, 1890. Enterorrhaphy was performed within an hour after the injury and the seven intestinal perforations were sutured, as described in the prefatory title. The patient gradually became asthenic and died March 14 following. The autopsy revealed the seven intestinal wounds perfectly healed. The local conditions were inadequate to explain the cause of death. The alcoholic stimulants, in the quantity to which the man had been accustomed, had been withdrawn, and the nutri-

ment offered was less familiar to the patient's tissue and evidently insufficient to sustain life. More generous feeding in this case would have been a wiser plan of treatment. In the management of a similar case, we would advise, in addition to the necessary food, the continuance of the alcoholic liquors, on which the tissues were accustomed to feed. The liberal use of Ducro's elixir, or the liquid peptonoids, by the large bowel, may answer a good purpose in such a case.

CASE II—*Gunshot Wound of the Abdomen, with Sixteen Perforations of the Small Intestines and Three Wounds of the Mesentery; Laparotomy; Enterorrhaphy; Recovery.*—The following is an abstract of the report in Vol. III, *Transactions of the Southern Surgical and Gynecological Association*, 1890.

F. H., white, aged thirty years, on September 11, 1890, accidentally inflicted a gunshot wound of the abdomen, a thirty-two calibre bullet entering at a point midway between the umbilicus and the pubes, opening the small intestines in sixteen places and wounding the mesentery in three places. There were evidences of shock, but not in extreme degree; his pulse beat 108 per minute. Within half an hour after the accident the man was conveyed to the hospital in the ambulance and submitted for operation. Upon exploratory abdominal section the condition above described was revealed. The intestines were practically empty, which explains the large number of intestinal wounds. Enterorrhaphy was performed as quickly as possible. On the evening of the following day the temperature rose to 102° F., the pulse to 150 per minute. These changes were attributable to some imprudence in feeding. Ten grains of antipyrine, administered hypodermatically, controlled the fever. On several occasions subsequently the temperature exceeded 101° F., but the usual range during the confinement in bed was about 99° F.

In these cases of intestinal wounds a rise in temperature easily follows indiscreet feeding. The pulse in this case was usually in accord with the temperature, but during the second week often ranged between 150 and 160 per minute. Such a pulse in any case calls for stimulation. From the second to the seventh day after the operation the patient was nourished exclusively by rectal alimentation. Such precautions in feeding as forbid alimentation by the stomach for five days are rarely necessary. The patient remained in the hospital from September 11 until October 18, and was then discharged, his alimentary functions being normal in every respect.



CASE III—*Gunshot Wounds of the Abdomen, with Twenty-one Perforations of the Intestines; Laparotomy; Enterorrhaphy; Death.*—Louis F., colored, aged thirty-three years, on January 25, 1891, received two wounds of the abdomen, inflicting twenty-one wounds of the intestines. The patient's condition was unfavorable. The operation above outlined was performed with all possible dispatch, but the patient died of shock on the same day.

CASE IV—*Gunshot Wound of the Abdomen, with Eleven Perforations of the Intestines; Laparotomy; Enterorrhaphy; Death.*—Joseph H., colored, aged forty-nine years, was admitted to the Charity Hospital, suffering as above described, and died two days later, on March 16.

The patient was conveyed to New Orleans by rail from one of the rural parishes of Louisiana, and at the time of the operation presented conditions unfavorable to a successful result. In cases of doubt as to the advisability of the operation, we give the patient the benefit of the doubt and operate.

CASE V—*Gunshot Wound of the Abdomen, with Eleven Perforations of the Intestines; Laparotomy; Enterorrhaphy; Death on the Fifth Day.*—Alf. M., aged thirty-two years, was admitted into the Charity Hospital on December 26, 1891, suffering as above described. The usual operation was performed, and the patient died of peritonitis on the fifth day.

CASE VI—*Gunshot Wound of the Abdomen, with One Intestinal and One Mesenteric Wound; Laparotomy; Enterorrhaphy; Recovery.*—George T., a negro of slender but strong physique, aged thirty years, was admitted into the Charity Hospital on March 31, 1892. At one o'clock P.M. on this day the patient received his wound. The thirty-eight calibre ball, delivered at short range, entering at a point midway on a line drawn between the anterior and posterior superior spines of the ilium, passing through this bone and penetrating the abdominal cavity, wounded the mesentery of the small bowel and lodged within the transverse colon immediately behind the linea alba. At the time of admission the patient's surgical condition was fair; his suffering, however, was intense. Five hours after the accident he lay on the table prepared for laparotomy. He complained bitterly of abdominal pain, referred to the umbilicus. This is a pretty sure indication, under such circumstances, of a serious internal injury. The operation began with a short tentative incision between the navel and the pubes, only large enough to verify the diagnosis of

an internal injury. Blood welling up through the little incision was conclusive evidence. The incision was quickly enlarged sufficiently to enable us to track the bullet and repair the injuries inflicted. The mesenteric vessels were bleeding freely. The quantity of blood in the peritoneal cavity was considerable. Only one intestinal perforation was found, and that on the under surface of the transverse colon near which the bullet had lodged in the bowel. The peritoneum showed evidences of universal inflammation that had existed in the past. There were many adhesions, and in several places observed the small intestines were welded together and much distorted. The cause of this condition will be explained hereafter. The patient reacted from the operation very satisfactorily, and recovered without any untoward symptoms, the temperature after the first record never exceeding 100° F., and the pulse never rising beyond 105 per minute.

Two years prior to the accident above recorded this patient received a gunshot wound of the abdomen. The muzzle of a forty-four calibre pistol resting against him delivered a ball which entered between the ninth and tenth ribs, midway between the axillary lines. He remained in this hospital under treatment for this accident for thirty-one days, and suffered from general peritonitis and its consequences. This wound explained the intestinal adhesions, above described, and the intense colic of which the patient has occasionally suffered.

The subject of the above sketch is certainly an excellent one for abdominal work, having recovered of two very serious gunshot wounds of the abdomen, one treated by the old plan of inaction, the other by the more modern active measures. It may be said that a patient of his previous record would most probably have recovered of his second wound without surgical interference. Surely the operation was his preservation in the second instance, for the hæmorrhage from the mesenteric vessels, which were bleeding freely at the time of the operation, would have resulted fatally.

CASE VII.—*Gunshot Wound of the Abdomen, with Three Wounds of the Intestines and One Mesenteric Wound; Laparotomy; Enterorrhaphy; Recovery.*—Charles N., white, aged forty-two years, attempted suicide on May 7, 1892, between seven and eight o'clock, by inflicting a gunshot wound of the abdomen. The ball, of large

calibre, entered on a transverse line touching the lower border of the costal arch and one inch to the right of a line drawn down from the left nipple, passed once through the mesentery and wounded the small bowel in three places.

Immediately after this attempt the man threw himself into the Mississippi River in further effort at self-destruction. At 11 o'clock P.M., three or four hours after the occurrence, the patient was conveyed to the hospital and prepared for laparotomy. After exploration and a positive diagnosis, enterorrhaphy was performed and the peritoneal cavity cleansed of a considerable quantity of blood. The patient reacted quickly and satisfactorily. Cracked ice in quantities of a teaspoonful was administered every hour from the time of the operation. This treatment is at variance with our rule, which usually forbids the reception into the stomach of anything during the first twenty-four hours after the operation; but this concession, to satisfy the demands of a most obstreperous patient, resulted not in the least harmfully. The man seemed determined upon self-destruction. Twenty-four hours after the operation beef-tea and chicken-tea in quantities of half an ounce were administered at intervals of two hours. On the following day one or the other of these articles of food was given alternately with a tablespoonful of Ducro's elixir. The bowels moved voluntarily on the sixth, seventh, eighth and ninth days after the operation. This case terminated favorably and in every way satisfactorily. The highest temperature point recorded at any time was  $101\frac{1}{2}^{\circ}$  F.; the corresponding pulse-rate 135 per minute.

CASE VIII.—*Gunshot Wound of the Abdomen, with One Perforation of the Intestine; Laparotomy; Enterorrhaphy; Death on the Second Day.*—Mike R., a negro, aged twenty-four years, was admitted into the Charity Hospital May 12, 1892, suffering from a gunshot wound of the abdomen, peritonitis and intestinal obstruction; pulse, 130; respirations, 39 per minute; temperature,  $103^{\circ}$  F. There was stercoraceous vomiting, the symptoms of impending collapse were present, and altogether the condition was very unfavorable. The wound was inflicted forty hours before admission, and when the patient came under our observation death seemed inevitable in a short time. However, the operation of laparotomy was attempted as a last resort. The intestine was wounded in but one place, as it lay immediately behind the linea alba midway between the umbilicus and the pubes. The ball notched the convexity of a coil of the small bowel and then lodged in the recto-vesical cul-de-sac. The localized

peritonitis circumscribed a faecal accumulation. Here the bowel was obstructed, and the local as well as the general symptoms appeared as unfavorable as possible. During the operation, which was quickly over, the patient's condition improved under forced stimulation. The reaction, however, was only partial, and the patient died at 3 o'clock on the following morning.

After the accession of peritonitis in these cases of abdominal wounds an operation, in our experience, is almost futile. We have not yet seen a case of gunshot wound of the intestines, with general peritonitis, recover after laparotomy and enterorrhaphy. The case above cited teaches how a patient in collapse can be revived for the time by douching the peritoneum with hot water. Shock does not forbid the operation of laparotomy in such emergencies as illustrated by these cases. Hot douches of the peritoneum are most potent means of exciting reaction. Moreover, shock in cases is often caused by the loss of blood from the visceral vessels, an accident which only the abdominal section can enable us to repair. These words are written to emphasize the necessity of an immediate operation in those cases where the location and nature of the wound are such as to give us reasonable hope of being able to repair the injury within. Under the influence of ether and other volatile heart stimulants the symptoms often improve during the operation.

CASE IX.—*Gunshot Wound of the Abdomen, with Five Perforations of the Intestines and Three Wounds of the Mesentery; Laparotomy; Enterorrhaphy; Death on the Second Day.*—Thomas F., white, aged fifty-six years, a police officer, was wounded in the discharge of his official duty, the muzzle of the pistol resting against the abdomen at the instant of explosion. The wounded man was conveyed to the hospital promptly, and within one hour he was prepared for laparotomy. All the surgical indications were plain, and the operation was done quickly. The patient took the anæsthetic badly. He was an alcoholic subject, and poorly prepared to withstand such a surgical ordeal. The walls of the abdomen were thick with fat. The patient never rallied completely from the operation, and died on the 10th of August, two days after the accident.

CASE X.—*Gunshot (bird-shot) Wound of the Abdomen; Lapa-*

*rotomy; Twenty (sutured) Perforations of the Intestines; Death.*—C. T., white, aged twenty-four years, while game hunting, discharged both barrels of his shot-gun, charged with bird-shot, into the right iliac region. The missiles ranged upward and toward the left side, wounding the intestines and mesentery in many places. The man was greatly shocked, but his condition, in our judgment, did not forbid the operation. While his case appeared desperate, we felt that his time while living could not be better spent than in an attempt at his preservation by the only method that promised any chance for life. The gun-wads were removed from the peritoneal cavity with masses of clotted blood, and the larger ones of the intestinal wounds were sutured. The patient died in collapse five hours after the operation.

CASE XI.—*Gunshot Wound of the Abdomen; Fourteen Perforations of the Small Intestines, mostly of the Jejunum; Laparotomy; Enterorrhaphy; Recovery.*—C. A. T., colored, aged twenty-four years, a man of ideal physique, temperate habits, except on holidays, and previous good health, received a gunshot wound of the abdomen on the morning of October 30, 1892. The accident occurred at eight o'clock A.M., near a railroad station several hours distant from New Orleans. The wounded man was conveyed in a horse-cart, three-quarters of a mile, to the nearest station. From the New Orleans depot he was conveyed to the hospital in the City Charity wagon. At the time of admission he was in agony and complained piteously of the abdominal pain. He received at once morphine sulphate gr.  $\frac{1}{4}$ , hypodermatically. Relief came promptly, and while the preceding case was under the operation the man fell asleep. Ten hours after the accident, after pretty rough travel and in a variety of vehicles, the patient was submitted for the operation. The brand of the weapon employed and the calibre of the bullet were unknown. The intestinal perforations were of large size, easily admitting the point of the index finger. Fortunately the intestines were practically empty, as the wound was received before breakfast. The wounds were in all sorts of positions in the circumference of the bowel, most of them involving the jejunum. When presented for operation the patient was perfectly relieved of pain and disposed to sleep; pulse, 66 per minute. No surgeon, whatever his experience, would have suspected such serious lesions as existed within. The usual mode of tentative action was adopted. An exploratory incision revealed blood in the peritoneal cavity, and through the crevice the intestinal

wounds were soon discovered. The usual operation followed. All the wounds of the intestines were sutured carefully and the cavity put in order and closed.

All went well until the morning of the seventh day, when the temperature reached 101° F., and the pulse 160 per minute. We realized the necessity of more active stimulation and more nutriment. Under the more generous treatment all the untoward symptoms disappeared. Gas escaped through the bowel on the third day, and on the seventh there was a natural evacuation. From this time the case progressed favorably, and was discharged cured on the 1st of January, 1893. The recovery of this case is the more remarkable in view of the hardships endured before admission into the hospital, and during the interval of ten hours which elapsed from the time of the accident until the operation. Again, it furnishes a useful lesson in showing how a wound of such gravity may be concealed by favorable symptoms. The perfect recovery of this patient, without a sequel causing the slightest inconvenience, is a fact worthy of record.

CASE XII—*Gunshot Wound of the Abdomen; Ten Intestinal Perforations Involving the Jejunum Mainly; Laparotomy; Enterorrhaphy; Recovery.*—Charles C., colored, aged twenty-one years, on December 13, 1892, received a gunshot wound of the abdomen. The bullet entered on the left side, one inch to the right of the mammary line and two inches below the costal arch, and, ranging toward the right, wounded the jejunum in ten places and lacerated the omentum extensively. The intestinal wounds were the largest that have ever come under our observation in similar cases, many of them easily admitting the index finger. One of these wounds lacerated more than one-half of the circumference of the bowel. The mesenteric wounds had bled profusely, and as soon as the intestines were disturbed in the search for the perforations the hæmorrhage was renewed, and the loss of blood was very considerable before the wounded vessel could be located and ligated. The pulse before the operation was 82; during the operation it ranged from 105 to 128 per minute, until suddenly it ceased at the wrist. The saline infusion was employed in the emergency, and about one pint of a solution, containing one drachm of common salt to the pint of sterilized filtered water, was injected into the median basilic vein. The immediate stimulation by this procedure was the patient's preservation. Immediately thereafter the pulse beat 96 per minute. One hour after the operation his pulse was 105. This patient now entered upon a



very stormy clinical career. On the third day the temperature reached  $102.5^{\circ}$  F., and ranged above  $101^{\circ}$  F. for five days. During the following thirteen days it reached or exceeded  $101^{\circ}$  F. on four different occasions. On the 3d of January the temperature commenced to rise to  $100^{\circ}$  F. every evening. This continued provokingly for six days, when the wound of entrance was opened to give escape to an intra-mural abscess. In the meantime the pulse behaved wildly, during one week in the early part of the history ranging above 110 per minute, and on one occasion, without provocation, reaching 140. The respirations for four days were 40 per minute; and during all these ominous days the patient was much distressed by hiccough.

On the second day gas escaped naturally from the bowel, and on the fifth day there was a voluntary intestinal action. During the time of confinement in bed the patient suffered very much of intestinal colic. This was temporarily relieved by the use of saline purgatives. The extensive laceration of the bowel, above mentioned, and the wound of the contiguous mesentery necessitated some constriction of the bowel, and this explained the cause of the suffering. Even after the patient's discharge from the hospital he complained of occasional colic, intense in character. The patient is under instruction to return for further surgical treatment should the pain persist in returning, and, especially, should it increase in severity. Four months have elapsed since the operation, and as the patient has not reported recently, we infer that matters are going on more smoothly as the time advances.

This case we considered the most important from a surgical standpoint of all those which have come under our observation. All of the ten wounds of the small intestines were of large size, most of them easily admitting the end of the forefinger. There was extravasation of the intestinal contents in the peritoneal cavity, but, as most of these wounds were jejunal, the loose matter was less noxious to the serous membrane than more offensive faecal contents. The perilous history of the patient, as narrated in the after-treatment, lends additional interest to this case.

CASE XIII—*Gunshot Wound of the Abdomen; Six Perforations of the Small Intestines, With Peritonitis; Laparotomy; Enterorrhaphy; Death.*—W., colored, was admitted into the hospital on February 5,

1893, eight hours or more after the accident, and declined the proposal of an operation until the morning of the following day. The exploratory laparotomy revealed general peritonitis, which had intervened upon the intestinal injury described in the caption of the case. The usual reparative operation was performed, and the patient died on the following day. It has not yet been our fortune to rescue such a case after the access of general peritonitis.

Of the thirteen cases reported, all but one were wounds of the small bowel, and most of them were wounds of great gravity. The mortality of eight in thirteen cases may seem quite a high death-rate, but we feel quite confident that the results would have been much more disastrous if operative surgical aid had been withheld. If no other argument was available to sustain the wisdom of the operation in these cases, the recovery of the three patients, one suffering of sixteen wounds of the small intestines, one of fourteen, and another of ten, would surely be sufficient.

*After-treatment.*—The after-treatment in cases of gunshot wounds of the intestines ranks co-equal in importance with the operative procedure.

*Foods and Feeding.*—During the first twenty-four hours we allow only cracked ice and Ducro's elixir, in quantities ranging from two to four drachms, and at intervals varying with the intensity of thirst and the necessity of stimulation. Some cases receive nothing into the stomach during the first twenty-four hours. If the state of the general nutrition does not require the stimulant, it is not administered until the pulse indicates the necessity. The urgency of stimulation is the greater in those patients, whose intestines were empty at the time of the accident, and especially in those who have lost strength by hæmorrhage. In all cases the use of stimulants in the latter part of the first week and the beginning of the second is a matter of great importance.

On the second day we begin with chicken-tea (3ss-5j) at intervals ranging from two to four hours. The quantity and the intervals must be determined by the exigencies in each case. The quantity of the food must be modified by the proximity of

the intestinal wounds to the stomach. In jejunal wounds the risks of early and generous feeding are greater. The other articles of food usually employed and allowed in quantities suitable to the local conditions, are beef-tea, soft-boiled eggs, boiled milk with lime water. The tender meats in small quantity and well cooked farinaceous foods are allowed in the second week. The quantity of these foods and the intervals must be determined by the conditions presented in individual cases. The alcoholic stimulants, especially those preserving the nutrients, as Ducro's elixir and the liquid peptonoids, may be given throughout the after-treatment, in quantities suitable to each case. These readily oxidizable agents so easily sustain patients and, moreover, they enter the circulation quickly without disturbing the intestinal wounds. The alcoholic stimulants are absolutely indispensable to those who are accustomed to their use. Attention to this particular point is of much importance.

In the after-treatment of these cases, rectal alimentation with the predigested foods and alcohol, in proportions varying according to the indications and at intervals regulated by the demand, is a matter of great importance. In all the cases above reported, the little nutriment allowed by the mouth was supplemented by rectal feeding. In one whose condition forbade the use of food by the stomach, the lower bowel alone sustained life long enough to tide the patient over the crisis. In Case II the patient was sustained by rectal alimentations for five days. In feeding these cases of intestinal wounds our purpose is simply to sustain life within safe bounds until the canal can resume its functions. Over-feeding easily proves disastrous. It requires but little food usually to tide patients over the first week. No symptom guides us so well as the pulse in determining the amount of food necessary. The fast and gradually failing pulse shows the hunger of the tissues.

*Heart-stimulants.*—The digitalis tincture (℥xv), brandy (3j), strychnine sulphate (gr.  $\frac{1}{60}$ – $\frac{1}{40}$ ), atropine sulphate (gr.  $\frac{1}{100}$ ) are the agents which have usually been employed in the cases reported. The first three named, having a general action as stimulants, are universally applicable, while the atropine sulphate, acting specially, has rendered special service in conditions of

collapse and copious sweating. The exhausting sweating of a patient, weakened by hæmorrhage or shock, is relieved in most instances by the hypodermatic injection of gr.  $\frac{1}{100}$  of the sulphate of atropine. In some cases this heart-stimulant is invaluable. All of these agents commended should be administered hypodermatically and repeated for the desired effect.

*Antipyretics.*—Septic fevers must be relieved by surgical measures if indicated. The fevers of nervous traumatism are best relieved by the carbon compounds of the aromatic series. The hypodermatic use of antipyrine is one of the most efficient measures in combating an irritative fever.

In most of the cases herein reported, the after-treatment comprised judicious feeding and the hypodermatic administration of the heart-stimulants as required.

*Contra-indications.*—The use of the opiates, as a rule, does harm. The paresis of the intestinal coats caused thereby, with its train of ills, should alone forbid the use of opium. The disturbance of the patient's nervous equilibrium leads often to serious complications. It is exceptional in our surgical service to administer an opiate in any quantity in the after-treatment of these cases of intestinal wounds.

Much harm may be done by the early use of purgatives. True the wounds, as a rule, are solidly healed during the first week, yet the healing may not withstand the action of a purgative. It is wise, in our judgment, to allow the bowels to move voluntarily, with, perhaps, the encouragement of an occasional enema during the second week.

A glance at the list of cases, herein reported, shows an improvement in our statistics with the increasing number of cases. Two of the last three cases were saved, and of these one had fourteen perforations of the small intestines, the other ten, inflicted with bullets of large size. The fatal case of the three had already developed general peritonitis. If the operation of enterorrhaphy be done before general peritonitis supervenes and done quickly, cleanly and thoroughly, with judicious after-treatment, the patient has more than even chances for recovery now, and surely these chances will be improved with the coming years.

## GASTROSTOMY BY WITZEL'S METHOD FOR PRIMARY CANCER OF THE ŒSOPHAGUS.

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THE patient, S. S., aged forty-eight, occupation puddler in rolling mills, was admitted to the Jefferson Hospital July 31, 1893, at the request of Dr. A. G. Miner, of Niles, Ohio. His father died of asthma, his mother of cancer of the breast. He has always had good health with the exception of an occasional brief attack of rheumatism. For the past thirteen months he has experienced trouble in swallowing; seven months ago he could swallow solid food without much discomfort, but now can swallow nothing but liquids. He states that the constriction came on gradually and that he noticed from time to time the lessening of the calibre of his œsophagus. When he takes nourishment he feels first an impediment to the passage at a point corresponding to the sterno-clavicular articulation; then the food passes with comparative ease until it reaches a point which corresponds to half an inch above the lower end of the ensiform appendix. Here he says he can feel a distinct obstruction, and while the food is passing this point he experiences pain in the median line posteriorly, under the inferior angles of both scapulæ (more severe under the left), in the epigastric region, though slight, and in the precordial region. The pain is darting in character.

During the past four months he has had slight attacks of hæmatemesis. On July 27, 1893, he lost considerable blood, enough to make him faint, but he attributes this to the introduction of an œsophageal bougie. He had had gradually increasing emaciation, and has lost forty-nine pounds in the last thirteen months, his weight in June, 1892, being 168 pounds, and in July, 1893, 119 pounds. During the last ten weeks he has had œsophageal bougies passed

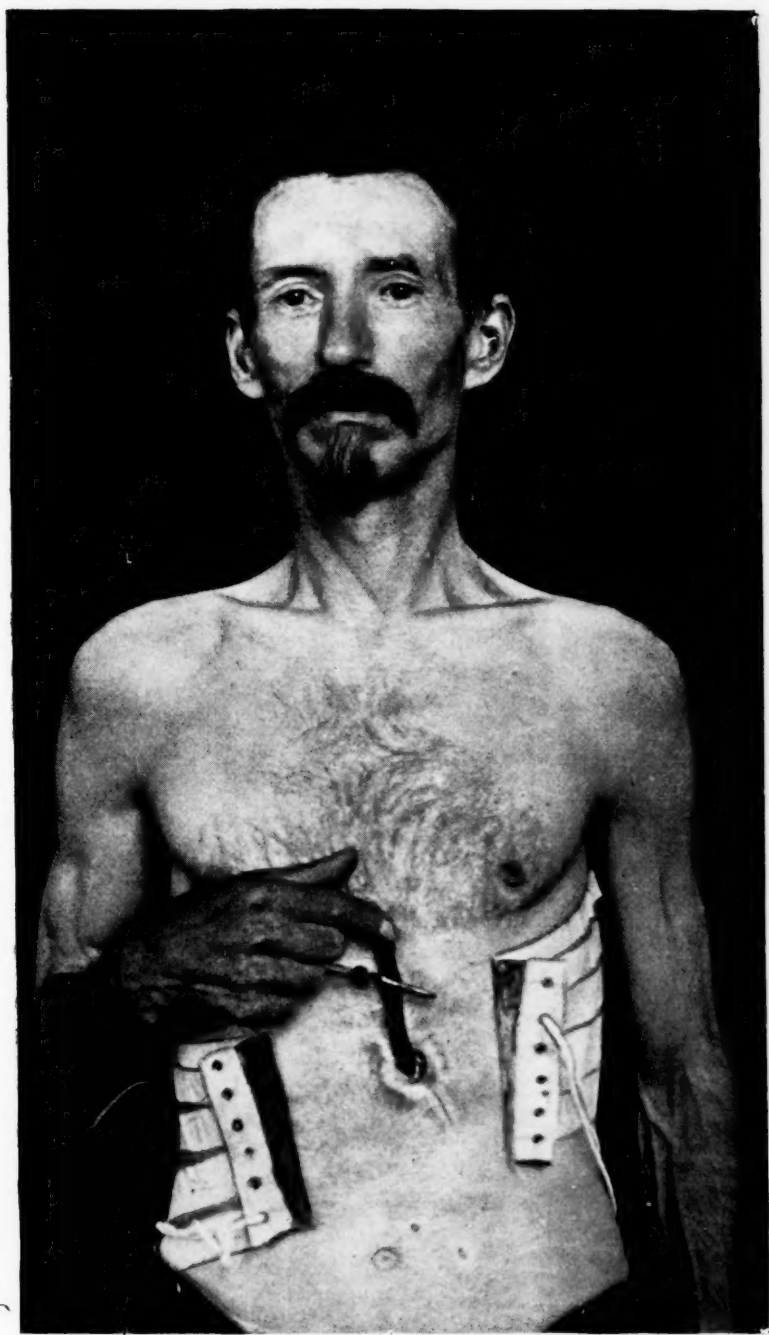
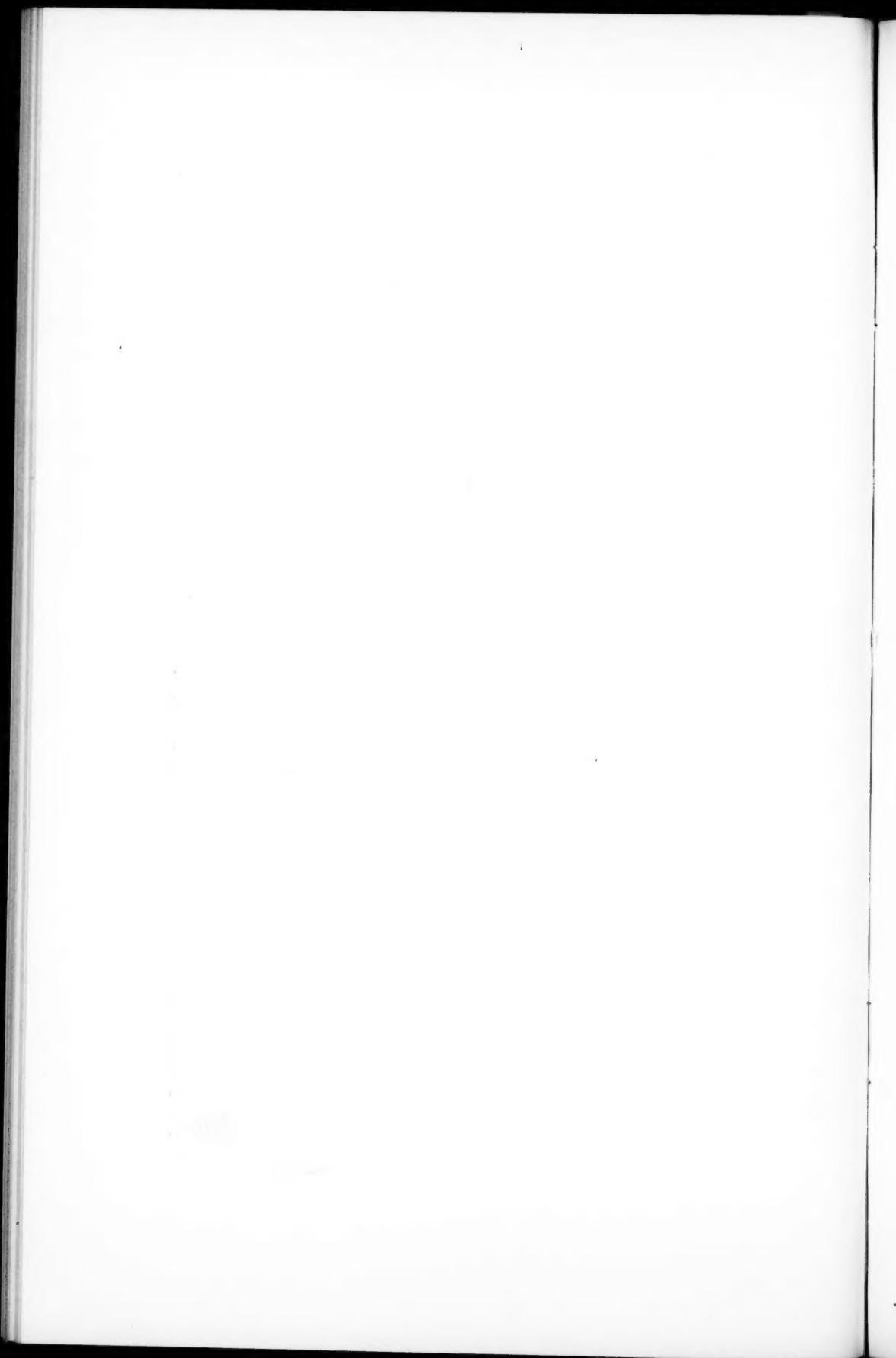


FIG. 1.—Gastrostomy by Witze's method, two months after operation, showing the absence of leakage and the consequent healthy skin, also the laced plaster retaining the tube and dressing.





twice a week. On the 31st of July I passed a No. 3 rectal bougie through the stricture.

He has never swallowed any corrosive fluids, and has had no traumatism. He does not indulge in alcoholic stimulants stronger than beer, and limits this to two or three glasses a day. He denies all history of syphilis. His appetite is impaired, tongue coated and bowels constipated. The urine is negative.

There was a resistance in passing the œsophageal bougie (circumference 4.2 centimetres) at ten and a half inches from the teeth, and at twelve inches the bougie would not pass.

Operation, August 2, 1893. An incision four inches long was made, beginning at the middle line and running to the left, a finger's breadth below the border of the ribs. The muscular fibres of the rectus were separated by the fingers and not divided. The liver was seen as soon as the peritoneal cavity was opened. Two fingers thrust in, however, very readily seized the stomach. This was brought forward and outside the wound, the margins being packed with gauze. A rubber tube, five inches in length (Size 25, Fr. catheter scale), was introduced into the stomach and infolded by two rows of Lembert sutures, after Witzel's method. The opening in the stomach was made toward the cardiac extremity and the tube lay parallel to the external wound, its external end emerging near the median line. Three stitches were now inserted into the walls of the stomach but not tied before it was returned to the abdomen, their needles being left threaded. As soon as the stomach was returned these needles were thrust through the abdominal wall and the stomach brought up to the margin of the opening. The tube was retained in place by a catgut stitch passed through the wall of the stomach and through a part of the wall of the tube so as not to open its calibre. About one inch of the tube was thrust into the stomach. The edges of the abdominal opening were now sutured by silkworm-gut and the ordinary dressing applied. A clip was placed on the tube to prevent the escape of the contents of the stomach.

September 28, 1893. The patient made an excellent recovery, without incident, excepting in one respect. On the second day after the operation the dressing became twisted in his movements in bed, and the tube was pulled out of the stomach. In order to replace it I was obliged to cut three stitches in the external wound. When the tube had been replaced these stitches were re-inserted. Apparently, however, such adhesion had formed that no harm was done by this accident excepting to delay the closure of the wound.

By the middle of September he began to expectorate some bloody mucus, presumably coming from the ulceration of the carcinoma in the oesophagus. He has gained about four pounds in weight, however, since the operation. For some weeks he has been unable to swallow even a mouthful of water. What nutritive gain there is from feeding, I presume has been almost counteracted by the

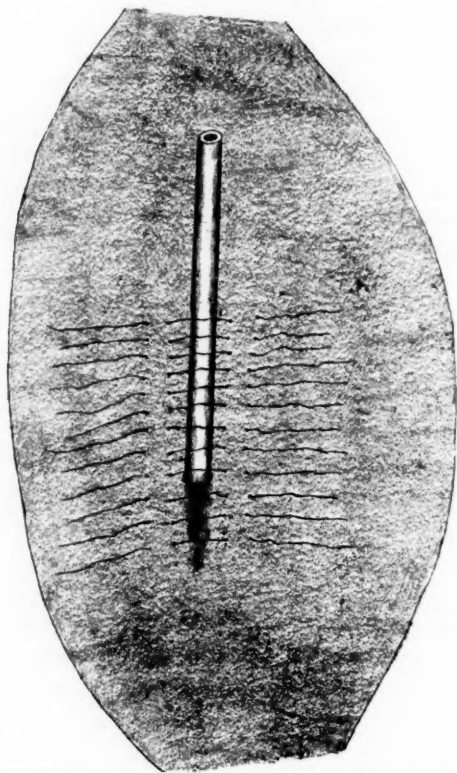


FIG. 2.—Witzel's method for Gastrostomy, showing application of sutures in wall of stomach embedding tube obliquely therein.

progress of the disease. Immediately after the operation he was fed for two days by rectal enemata. Then I began with small amounts of milk, poured into the stomach through the tube. This feeding has been gradually increased, until at the present time his daily food may be summarized about as follows: Milk, two quarts; beef, mutton and chicken broth, each about twenty ounces; and a dozen eggs.

This is varied by substituting gruel, thin custard and other similar food. He is walking about with much comfort. The tube is held in place by a gauze dressing, which in turn is retained by rubber adhesive plaster on each side. This is laced through eyelet holes. (See Plate, Fig. 1). No escape of the gastric contents has taken place alongside of the tube.

November 1, 1893. The patient is still doing well three months after the operation. There is absolutely no leakage whatever.

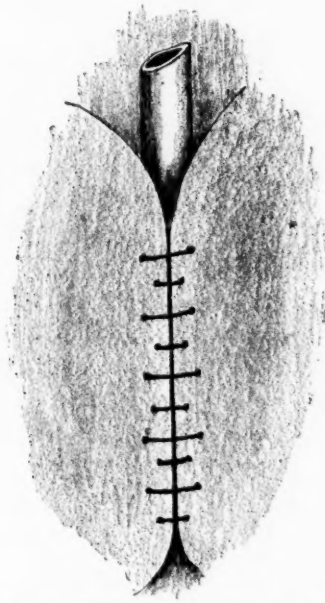


FIG. 3.—Sutures tied completely embedding tube for same distance.

Greig Smith states that the operation of gastrostomy was first proposed by Egebert, a Norwegian surgeon, in 1837, received its name from Sedillot, in 1846, but had a very unsatisfactory history and development until the time of Sidney Jones, of St. Thomas' Hospital, London, in 1874. Since then it has made rapid progress in favor in the profession, and a variety of different methods of its performance have been devised, until now its technique is presumably so satisfactory that but little improvement can be made upon it. The conditions which demand the

operation are, of course, any cause which prevents the introduction of aliment into the stomach by the mouth, for instance, stricture of the œsophagus from any reason, whether by cancer, cicatricial constrictions from caustics, etc., occasionally from the pressure of extra-œsophageal growths, or from malignant disease in the mouth or pharynx. Whitehead<sup>1</sup> has reported a case in which gastrostomy was done on account of obstruction due to a diverticulum.

There are practically five methods by which gastrostomy is done.

(1) The method originally proposed by Egebert, and modified in its details by Fenger and Howse.<sup>2</sup> In this an abdominal incision is made parallel with the border of the ribs, and the stomach is attached by sutures to the abdominal wall. Two sutures are placed in the wall of the stomach in order later to identify the exact position for puncture (Bryant), and the stomach is not opened until the third or fourth day. This method has given rise to so much trouble, however, especially from leakage, that various devices have been employed for the purpose of preventing this annoyance, which, in consequence of the irritation from the escaping gastric juice, caused wide-spread eczema or even ulceration. Handford<sup>3</sup> notices, for instance, "a hernia-like protrusion of the mucous membrane of the stomach from the fistulous opening, forming a red, mushroom-shaped, insensitive mass, nearly two inches in diameter. This was easily replaced, but led to constant leakage of the stomach contents." Moreover, it is very important to observe that in Whitehead's case, above alluded to, the post-mortem showed that the adhesions of the stomach to the abdominal wall had so loosened by traction that they were very slight indeed when the patient died, six months and a half after the operation. Hence, the importance of secure suturing of the stomach to the abdominal wall, as I believe I have obtained in my own case by suturing the stomach to the abdominal wall.

<sup>1</sup> Lancet, 1891, I, p. 11.

<sup>2</sup> Heath's Dict. of Surg., p. 590.

<sup>3</sup> Lancet, 1891, II, 988.

(2) The method of Von Hacker.<sup>1</sup> This operator proposed to use the belly of the rectus muscle as a sphincter. In the first method of operating the fibres of this muscle are divided by a transverse incision. Von Hacker proposed to make a vertical incision and a blunt dissection of the belly of the muscle, hoping that the rectus fibres would thus act as a sphincter. Girard<sup>2</sup> modified this by crossing the fibres of the muscle so as to form a more efficient sphincter. Von Hacker himself has been obliged to use the Scheimpflug canula in order to prevent leakage.

(3) The method of Hahn.<sup>3</sup> In this a return is made to the original transverse incision, but a second incision is made in the eighth intercostal space. The stomach is drawn through this space, and fastened there between the cartilages. In addition to the danger of possibly opening the chest, necrosis of the cartilages has taken place, although Hahn affirms that there is no danger either to the diaphragm or the pleura. He believed that the cartilages of the ribs acted like a sphincter or stop-cock.

(4) The method of Witzel.<sup>4</sup> In this method the abdominal cavity is opened, the stomach drawn out, and a moderate-sized rubber tube is inserted into the stomach toward the cardiac extremity, through as small an opening as will admit it. The gastric end is then buried for about two inches by two rows of ordinary Lembert, or Cushing right-angled sutures. The free end of the tube is then brought out through the abdominal wound, and is either fastened there, or possibly after a time may be removed and inserted as needed.<sup>5</sup> The great advantage of this operation is the ureter-like, oblique entrance of the tube into the stomach; and, as is shown by the post-mortem examination in one of Meyer's cases,<sup>6</sup> the result is a nipple-like protuberance

<sup>1</sup> Wien. Med. Woch., 1886, Vol. XXXVI, 1073-1110, and Wien. klin. Woch., 1890, 693.

<sup>2</sup> Corresp.-bl. f. Schw. Aertze, 1888, No. II.

<sup>3</sup> Centralbl. f. Chir., 1890, 193.

<sup>4</sup> Centralbl. f. Chir., 1891, 601.

<sup>5</sup> I have thus tried to remove the tube temporarily in my patient but had to abandon it from the difficulty of its reintroduction.

<sup>6</sup> ANNALS OF SURGERY, 1893, Vol. XVII, 594.



into the calibre of the stomach, which will prevent effectually the escape of any fluids.

This seems to me to be by far the best method yet devised, as it is simple, moderately rapid, and, above all, as in the present case as well as a few others in which the operation has been done, it is effectual in preventing any leakage.

I did not immediately begin feeding the patient through the tube, as I deemed it safer, the patient being in very fair physical condition, to nourish him for a couple days by rectal enemata. I did, however, introduce an ounce of milk into the stomach the moment the tube was inserted, in order to make sure that perforation of the mucous membrane, as well as the muscular wall, had been effected. I think it likely that in another case, with the courage born of experience, I should be disposed to nourish the patient by small amounts through the tube immediately after the operation. I wished to try with this patient a method which has been used by others, the effect of his chewing meat which had been previously finely hashed, and then washing it into the stomach through the funnel. This gives the patient the satisfaction of mastication and of taste, and at the same time mixes the saliva with the food before its introduction into the stomach. Although not a man of especially sensitive nature, the idea of doing this seemed to disgust the patient so much that he was not willing to attempt it. The result, however, shows that he has received sufficient nourishment to gain somewhat in weight. Whether his constant hunger, in spite of the nourishment taken, is due to the want of satisfaction of his sense of taste, I do not know.

(5) Frank<sup>1</sup> has reported still another method practiced in the clinic of Albert, in Vienna. After making the abdominal incision parallel with the costal cartilages, a narrow fold of the anterior wall of the stomach is drawn out of this wound. A second incision is next made through the skin, half an inch above the first and over the costal cartilages. After separating the skin from the underlying parts, the fold of the stomach wall is drawn out, first through the abdominal wound, then under the

<sup>1</sup>Wien, klin. Woch., 1893, No. 13.

skin, and, finally, through the second opening, and is fixed there, the mucous membrane being stitched to the skin. Whether experience will show this to be more valuable and more easily done than the method of Witzel cannot yet be determined. It is said that no leakage occurs. Of course, as pointed out by the author, it would not be advisable in cicatricial stricture of the œsophagus, because the fistula could not easily be closed, should it be desired to do this at any time.

It is interesting to note that Zweifel,<sup>1</sup> of Leipzig, has used the same process as Witzel in making an artificial urethra. This idea was suggested by Witzel in his paper. In a case of carcinoma of the urethra in a woman, Zweifel extirpated the entire urethra and part of the bladder, closed the latter viscus, and then by a supra-pubic cystotomy made an artificial urethra after Witzel's method.

The mortality of the operation was last collectively investigated by the late Samuel W. Gross.<sup>2</sup> At that time Gross collected 207 gastrostomies, with sixty-one deaths, a mortality of 29.47 per cent., with a prolongation of life, on an average, at the date of the last reports, of eighty-three days.

Comparing gastrostomy with other procedures, there were thirty-two cases of œsophagostomy, with nineteen deaths; a mortality of 59.37, and a mean duration of life of fifty-two days. Nineteen internal œsophagotomies, with six deaths, or a mortality of 31.57, and an average prolongation of life of 256 days. Five combined œsophagotomies have resulted in two deaths, a mortality of 40 per cent., and a mean duration of life of 168 days. Five œsophagectomies gave three deaths, a mortality of 60 per cent., and a mean duration of life of fifty days. Three retrograde divulsions all resulted in recovery, with a mean duration of life of twenty-two days.

In the case of Handford, already alluded to, some very interesting physiological experiments were made. He introduced a small rubber tube attached to a female catheter into the stomach, and connecting it with a Marey's registering tambour and

<sup>1</sup> *Centralbl., f. Chir.* 1893, 785.

<sup>2</sup> *Trans. of the Amer. Surg. Assoc.*, 11, 1885.

clock work revolving drum, he found the respiratory and cardiac curves well marked, but absolute absence of any peristalsis. This he accounted for by the adhesion of the stomach to the abdominal wall. Yet digestion was efficiently performed, probably due to the replacement of this motion by the movement produced by the heart and diaphragm. He observes also that "the rapid introduction of large quantities of food into the stomach, the absence of pleasure in eating and the normal perception of flavors are not incompatible with very perfect digestion and active nutrition." Fine division of the food determined its rapid and easy digestion. Lactic acid was found as early as half an hour after eating. Hydrochloric acid was absent until as late as two hours after the meal.

## A CASE OF INTRA-PERITONEAL RUPTURE OF THE BLADDER; RECOVERY AFTER LAPAROTOMY.

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THE patient, W. H. B., a white male, thirty-three years old, May 13, 1892, fell thirty-five feet down the outside of an elevator shaft, striking the ground "all doubled up," with most of his weight on his left hip.

He was brought to the Emergency Hospital about one-half hour later, in a state of shock and complaining of great pain over the region of the hip and hypogastrium. Was very sore on any movement. Sent to the ward and kept under observation.

Eight hours later the shock and pain continued, the latter most marked over hypogastrium, where there was some ecchymosis and swelling. There was also marked abdominal tenderness, and the pulse small and thready. Catheterizing him, a small quantity, half-ounce, of bloody urine was withdrawn.

Rupture of the bladder was diagnosed and an operation determined on.

Incision was first made into the prevesical space. The cellular tissue was found extensively infiltrated. On cutting down to the bladder it was collapsed, but no extra-peritoneal injury could then be detected. Fracture involving the symphysis and descending ramus of the pubis on the left side was made out. On injecting a solution of boracic acid per urethram it was felt to well up at the bottom of the incision. As only a small part of the fluid returned in this way, and the balance not distending the bladder, it was supposed to be escaping into the pelvic cavity.

It was, therefore, deemed advisable to open the general peritoneal cavity, and the original incision was prolonged upward. The intestines distended, and, showing signs of peritonitis, crowded into the wound. Arrangements being made for the Trendelenburg position, after the elevation of the pelvis the intestines gave little further trouble.

On injecting more of the boracic lotion it could be felt to well up in the bottom of the pelvis, with a distinctly urinous odor, proving that the rupture was intra-peritoneal and beyond the reflexion of the pelvic fascia.

The bladder was carefully examined to locate the injury, but without success. It was then opened and a Trendelenburg tube introduced. An effort was then made to close in the ruptured area by suturing the side of the bladder as low down as it could be reached to the pelvis in front. The general peritoneal cavity was then irrigated with a 1-10,000 bichloride solution and a drainage tube introduced in front of the bladder. The operation was completed by placing a tampon of iodoform gauze in the abdomen behind the bladder.

The shock following the operation was severe, but the patient made a good recovery. Temperature and pulse became normal on the fifth day. He left the hospital one month from admission, and when seen four months afterward was in perfect health.

The after-treatment consisted of free saline catharsis and boracic fomentations to absorb the urine from the anterior wound. These were changed at first every hour, the interval being increased as the wound in the bladder healed. The bladder was at first washed out through the drainage tube twice a day with a solution of boric acid. The iodoform tampon was changed at the end of the second, and permanently removed at end of the fourth day. The drain from the prevesical space two days following, and the bladder drain two weeks later. I attribute success in this case to a comparatively early operation and the open method of dealing with the infected peritoneum.

I append a list of all the cases that could be tabulated up to date from a search made at the Library of the Surgeon-General's office here :

TABLE OF CASES OF LAPAROTOMY FOR INTRA-PERITONEAL RUPTURE OF URINARY BLADDER.

OPERATOR.	DATE.	INJURY AND SYMPTOMS.	OPERATION.	RESULT.	REFERENCE.
Blum, A.	May 15, 1887.	M., aged twenty-eight, run over by a wagon; pain in thigh; could not urinate; May 16, abdomen distended; painful; catheter inserted and urine drawn which was free of blood; vomiting; peritonitis.	Forty hours after injury incision in linea alba; on opening peritoneum a large quantity of yellow fluid escaped; rupture on upper portion of bladder the size of a franc; rent closed by six Lembert sutures; vomiting ceased; peritonitis allayed.	Entirely recovered June 20.	Arch. Gèn. de Médecine, Paris, 1888, T. XXII, p. 22.
Brown, J. Y.	April, 1887.	A. W., fell on corner of doorstep; when seen, patient in a state of collapse; vomiting; severe pain; passed bloody urine.	Laparotomy twenty-two hours after injury; blood-stained fluid found in peritoneal cavity; rent on posterior surface of bladder 1½ inches long; closed with Lembert sutures including peritoneal and muscular coats of viscus; no leakage when filled with Thiersch's solution; catheter tied in bladder.	Died sixteen hours after operation.	Medical Record, New York, 1888, XXXIII, p. 632.
Bull, W. T.	October 27, 1884.	—, aged forty-six; fall into cellar; great shock; bloody urine; dullness half way to umbilicus; catheter went beyond bladder; also fracture of pelvis.	Laparotomy thirteen hours after injury; rent in posterior wall of bladder 3¼ inches long; seven Lembert sutures; catheter tied in.	Died in seven hours.	ANNALS OF SURGERY, 1885, I, 67.
Duncan, J.	May 5, 1886.	W. E., aged thirty-eight; run over by cart; shock; desire to urinate, but no power; bloody urine; peritonitis; vomiting.	Perineal cystostomy failed to discover rent; abdominal section twenty-two hours after injury; blood and urine in cavity; rent in posterior vesical wall 2½ inches; bladder wound was not sutured; glass drain introduced into bladder.	Died in fifty-five hours.	Lancet, 1886, II, 399.
Fox, J. M.	August 16, 1866.	E. M., aged forty-five; fell from a window; pain; unable to urinate; three ounces of bloody urine drawn by catheter; anxious expression; also fracture through neck of right femur.	Twenty hours after injury incision just above pubes; bloody urine and blood clots in cavity; superior surface of bladder torn from side to side; fifteen Lembert sutures; catheter passed through urethra and left in bladder; peritonitis.	Died August 18; forty-two hours after operation.	Medical News, Philadelphia, 1887, LI, p. 673.



## CASES OF LAPAROTOMY FOR INTRA-PERITONEAL RUPTURE OF URINARY BLADDER.—Continued.

OPERATOR.	DATE.	INJURY AND SYMPTOMS.	OPERATION.	RESULT.	REFERENCE.
Heath, C.	November 25, 1878	J. B., aged forty-seven; hit in the stomach; belly tense; bloody urine by catheter; water injected felt in abdomen by patient.	Laparotomy forty hours after injury; extensive rupture of bladder; continuous suture.	Died in six days; suture had given way.	Medico-chirurgical Transactions, Vol. LXII, 337.
Herrick, J. B.	May 31, 1889.	J. D., aged twenty-eight; kicked by a horse in supra-pubic region; severe pain; bloody urine drawn by catheter; tympanitic; injection of boric acid solution confirmed rupture.	Twenty-three hours after injury incision from 1 inch above umbilicus to symphysis pubis; on puncture reddish fluid escaped; rent in bladder on posterior wall near fundus; Lembert sutures; cavity irrigated with boric acid solution; glass drain.	Died forty-nine hours after accident.	North American Practitioner, Chicago, 1889, I, 408.
Hitchcock, H. O. Hofmohl.	1888. March, 29, 1886.	Rupture of bladder. K. L., aged twenty-seven; fell from a window; symptoms principally those of extra-peritoneal rupture; also fracture of right forearm.	Laparotomy; rent six inches in length; sutures. Laparotomy ten hours after injury; intra- and extra-peritoneal rupture of bladder; great infiltration of tissues with blood; partial suture of bladder; upper portion left open and drained.	Died. Recovery.	Pittsburgh Medical Review, 1888, II, 55. Wiener Medizinische Presse, 1886, p. 1228.
Holmes.	June 9, 1887.	H. P., aged twenty-four; kicked in the abdomen; great pain; unable to void urine; blood-stained urine drawn per catheter.	Incision in median line six hours after injury; peritoneal cavity opened; rent in bladder about two inches long; closed by eight sutures; cavity washed out; during next night voided urine naturally.	Recovery.	Lancet, London, July, 1887.
Hulke.	January 14, 1892.	C. E., aged thirty-three; butted in abdomen; great pain; anxious expression; urgent desire to micturate; urine mixed with blood, drawn repeatedly; vomiting.	January 17, laparotomy; several ounces of grumous, bloody fluid escaped on opening peritoneum; rent in posterior wall of bladder 2½ inch long; closed with double row of sutures; peritoneal cavity flushed; vomiting returned; peritonitis.	Died January 18.	Lancet, London, 1892, II, p. 197.
Keyes, E.	December 1, 1887.	P. K., aged twenty-two; run over by cart; scalp wound and lacerated wound of scrotum; abdomen tympanitic; vomiting; collapse imminent.	Laparotomy; twenty-two hours after injury; bloody fluid gushed out; rent in bladder 1½ inches long in front of peritoneal reflection; nine Lembert sutures; bladder distended with Thiersch's solution found water-tight; no catheter inserted.	Died eighteen hours after operation.	Medical Record, New York, 1887, XXXI, 781.

CASES OF LAPAROTOMY FOR INTRA-PERITONEAL RUPTURE OF URINARY BLADDER.—Continued.

OPERATOR.	DATE.	INJURY AND SYMPTOMS.	OPERATION.	RESULT.	REFERENCE.
Knight.	October 15, 1888.	G. H., aged forty-nine; fell against corner of a bench; great pain; vomiting; inability to urinate; catheter passed without result; abdomen tender and distended.	October 17, laparotomy; fluid welled up on opening peritoneum; ragged rent in fundus of bladder 1½ inches long, closed with continuous sutures; peritoneal cavity washed; peritoneum brought together with catgut, and abdominal wall with wire suture; soft catheter tied in bladder.	Recovery; discharged well, November 25.	New Zealand Medical Journal, Dunedin, 1889-90, III, 158.
MacCormac, W.	September 22, 1885.	W. S., aged thirty-three; fell against iron post; no shock; ninety-five ounces of blood-stained urine withdrawn by catheter; great pain; vesical tenesmus. Had walked one mile to hospital day after injury.	Laparotomy nineteen hours after injury; vertical rent in posterior wall of bladder 4 inches long; sixteen Lembert sutures; peritoneum divided at sides to relax bladder walls; abdominal drainage tubes.	Rapid recovery.	Lancet, London, 1886, II, 1118.
MacCormac, W.	November 17, 1886.	C. F., aged thirty-seven; fall from scaffold; no symptoms of intra-peritoneal injury; no shock; next day fluid present in abdomen; vesical tenesmus; signs of incipient peritonitis; nausea.	Laparotomy twenty-seven hours after injury; large amount of bloody fluid in abdomen; rent 3 inches long in upper part of posterior bladder wall; twelve Lembert sutures; urine passed voluntarily; no abdominal drainage.	Recovered.	Lancet, London, 1886, II, 1118.
McGill, A. F.	October 20, 1886.	M. B., aged fifty-four; run against iron gate; insensible for some time; pain; bloody urine; could not urinate; peritonitis.	Laparotomy sixty-eight hours after injury; pint of urine in cavity; 4 inch rent in apex and fundus of bladder; nine chromic sutures; autopsy: bladder wound firm; no fluid in cavity.	Died in seventeen hours.	Lancet, London, 1886, XXI, 972.
Robson, A. W. M.	.....	—, aged sixty-eight; desire but inability to micturate; bloody urine drawn by catheter; fracture of right side of pelvis.	Membranous urethra opened and tube introduced into the bladder; laparotomy three hours after injury, in median line, but as no urine or rupture into peritoneal cavity was found, the external wound was closed.	Died in a few hours from shock. At autopsy it was found that a fragment of the pelvis had penetrated anterior wall of bladder.	MacCormac on Abdominal Section, London, 1887, p. 53.
Scion.	1887.	—, aged twenty; retention of urine; bloody fluid drawn off; hiccup; pain above pubes.	Laparotomy; rent in front of bladder admitted tip of index finger (extra-peritoneal); wound stitched to abdominal wall; drainage tube nine days.	Recovered. It is doubtful whether peritoneal cavity was opened or not.	ANNALS OF SURGERY, February, 1887.

## CASES OF LAPAROTOMY FOR INTRA-PERITONEAL RUPTURE OF URINARY BLADDER.—Continued.

OPERATOR.	DATE.	INJURY AND SYMPTOMS.	OPERATION.	RESULT.	REFERENCE.
Sonnenburg.	1885.	No peritonitis for twenty-four hours; 1000 grams clear urine drawn off.	Laparotomy two days after injury; rent from vertex to neck along posterior wall of bladder; no sutures; drainage tube; infiltration of urine and intense peritonitis.	Died on fourth day.	Centralblatt für Chirurgie, 1885, p. 838.
Symonds, C. J.	1888.	Girl, aged seven; fell from a bridge into a passing barge; extreme collapse; catheter inserted six hours after accident, and dark blood drawn off.	Laparotomy seven hours after injury; dark fluid, with urinous odor escaped; rent $1\frac{1}{2}$ inches in bladder closed with twelve Lembert sutures; catheter tied into bladder, which irritated patient.	Died on eighth day.	Lancet, London, 1888, 1, 977.
Teale, T. P.	December, 6, 1883.	F. S., aged twenty-five; kicked in abdomen; unable to urinate; abdomen distended and tender; only one ounce fluid drawn by catheter; no shock.	Laparotomy two hours after injury; rent in posterior surface of bladder near apex, closed by six sutures; unusual oozing of blood from abdominal wound.	Died in about twenty hours.	Lancet, London, 1887, 1, 1133.
Rose, P. Edward.	1892.	Boy, seven years old; admitted to hospital two days after accident; abdomen distended and tender; dullness in lumbar regions and ecchymosed; vomiting; constipation; passing only few drops of bloody urine.	Laparotomy; bladder contracted and stellate rent on upper surface; not sutured; drains on either side and packed with iodoform gauze and catheter left in bladder.	Recovered.	Deutsche Zeitschrift für Chirurgie, Bd. XXXI, Heft 3 and 4.
Walsham, W. J.	March 1, 1887.	C. H., aged twenty-two; butted in abdomen; great pain, but little shock; next day on passing catheter no urine flowed.	Laparotomy thirteen hours after injury; intra-peritoneal rent in posterior wall of bladder sewed up with nine Lembert sutures; bladder injected with boric acid solution found tight; peritoneum irrigated; abdomen closed as in ovariotomy.	Recovered.	Lancet, London, 1888, 1, 173.
Walter.	.....	— aged twenty-two years; hit in the abdomen; signs of active peritonitis.	Laparotomy ten hours after injury; much blood and urine; extensive tear at base of bladder; intestines long; no sutures into bladder; drainage tube; catheter in bladder; gum treatment.	Recovered.	MacCormac on Abdominal Section, London, 1887, p. 34.
Willet, A.	June 11, 1876.	T. F., aged forty-eight; kicked over pubes; shock and pain; bloody urine by catheter; symptoms of peritonitis.	Laparotomy twenty-nine hours after injury; rent $\frac{3}{4}$ inches across fundus of bladder; interrupted sutures.	Died in twenty-three hours. At autopsy, portion of bladder wound found open.	St. Bartholomew Hospital Reports, 1876, p. 209.

CASES OF LAPAROTOMY FOR INTRA-PERITONEAL RUPTURE OF URINARY BLADDER.—Continued.

OPERATOR.	DATE.	INJURY AND SYMPTOMS.	OPERATION.	RESULT.	REFERENCE.
Schlange, H.	1892.	Man, aged thirty-four; injured by heavy wagon; laparotomy twenty-four hours after; an intra- and extra-peritoneal rupture; intra sutured, extra packed with iodoform gauze.	Urine mopped out of peritoneal cavity, not flushed.	Recovered.	Arch. für Klin. Chirurgie, Bd. XLIII, Heft 1
Page.	February 6 1892.	Injured by man falling on him; next day patient anxious expression; thready pulse and distended abdomen.	Laparotomy found collapsed bladder with stellate wound on back and upper part of fundus sutured.	Died before completion of operation.	Lancet, London, February 6, 1892.
Kerr, J.	May 13, 1892.	Man, aged thirty-three; fell thirty-five feet; fracture of pelvis; on opening prevesical space injected fluid not returning through wound or filling bladder; laparotomy performed and combined intra- and extra-peritoneal rupture made out.	Operation eight hours after injury: side of bladder stitched to pubes and pelvis tamponed with iodoform gauze; bladder and Ketzhus space drained.	Recovery.	ANNALS OF SURGERY, December, 1893
Pilcher, L. S.	July 26, 1893.	Man, aged twenty-three; fell from second story of a dwelling house while drunk; no apparent injury at time; gradual supervention of symptoms of internal hemorrhage; six hours later found in profound collapse; empty bladder and slight bloody discharge from urethra; rallied by stimulants and intravenous saline infusion of forty fluid ounces.	Laparotomy twelve hours after injury; abdomen filled with blood and urine; longitudinal rent, 1½ inches long, at apex of bladder; bleeding from torn superior vesical veins; abdominal cavity sponged out and irrigated; bladder tear sutured; abdominal wound closed.	Death two hours after close of operation from shock and anemia.	Personal Communication.

Twenty-nine cases. 11 recoveries; 18 deaths.

## COMPLETE DISLOCATION OF PATELLA, REDUCED BY ARTHROTOMY AFTER SIX YEARS.

By JOHN W. PERKINS, M.D.,

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PROFESSOR OF SURGERY, KANSAS CITY MEDICAL COLLEGE; SENIOR  
SURGEON, ST. MARGARET'S HOSPITAL.

THE following case I saw with Dr. J. D. Griffith, of this city,  
and later on assisted him in the operation:

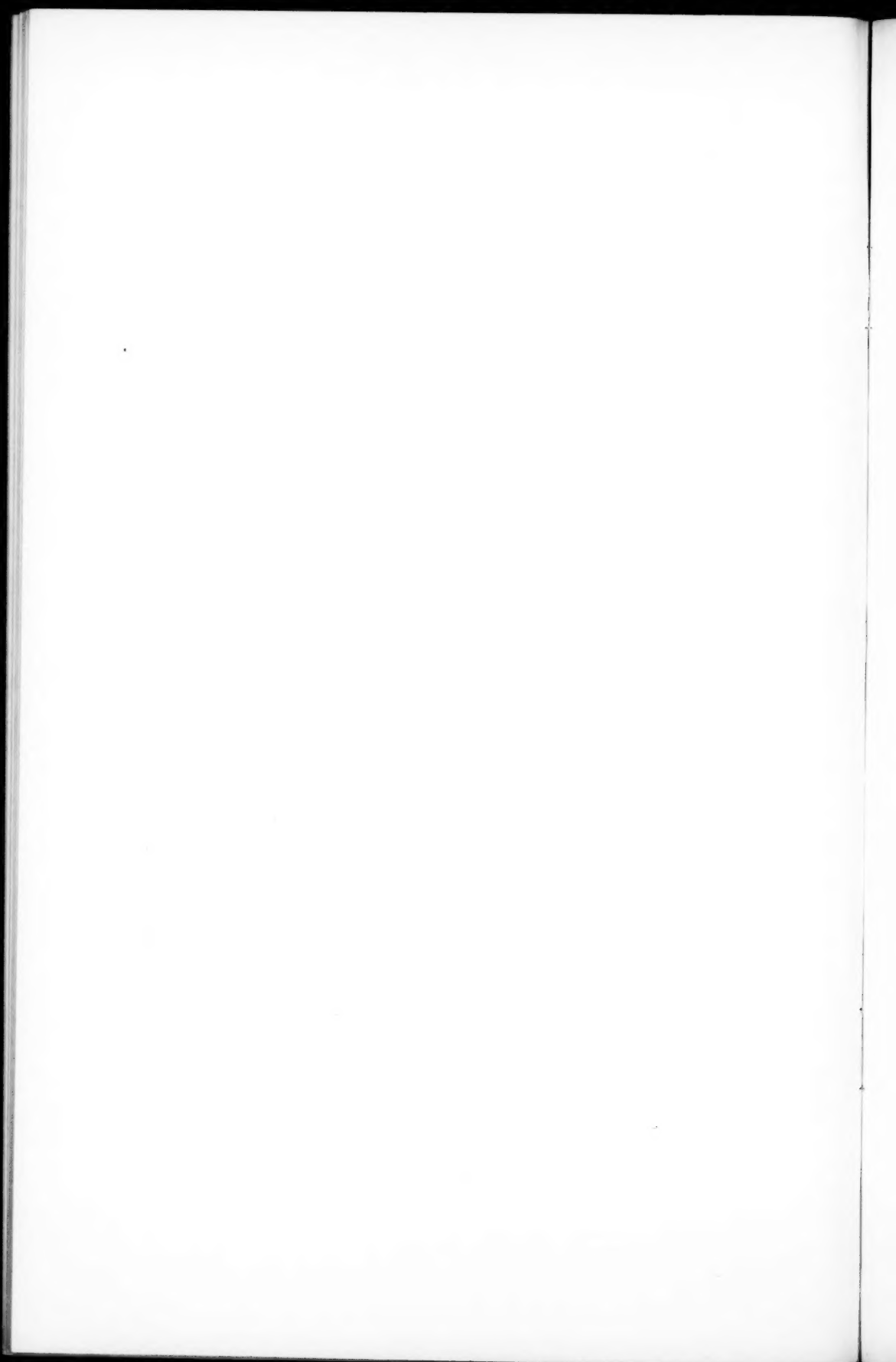
Annie R., aged twenty-six, a stout, well-developed Quaker girl, first injured her right knee, in 1881, by having her heel suddenly slip off a small rock on which she was standing, her toe remaining on the rock. Her patella was thrown out of place by muscular effort, but almost immediately slipped back again, and she had a moderate synovitis following. Not long after this the dislocation was repeated, and was again reduced by the muscle traction. She continued to have trouble with the knee for months; she described it as "weak and uncertain." A year after the first injury the knee gave way while she was going down the porch steps, and she fell, doubling the leg violently under her and dislocating the patella farther out of line than it ever had been before. This time it did not go back, and her physician was unable to reduce it. A sharp attack of synovitis followed, which persisted for many weeks. When she finally tried to use the limb she found it quite useless. The patella remained on the outside of the knee. She could bear no weight on the leg except in the rigid extended position, and this was maintained with great difficulty. A stiff knee cap improved it somewhat, but even then it would frequently give way. This was most marked when she tried to go down stairs, and, as a consequence, she had several severe falls, which did not injure the knee again as far as she knows. She was able to flex the knee on the thigh, but when in the bent position she could put no weight upon it. She used one crutch continually.

About a week after the fall which resulted in the complete dislocation, she noticed that her right toe began to turn out more than



FIG. 1.—Dislocation of patella. Four years after operation.





the left, and that the whole leg was twisting round on the thigh. This twisting process had continued, growing worse yearly. In spite of the disability she had been able to do her work as a school teacher, by the aid of her crutch, most of the time. After five years she applied at St. Joseph's Hospital for treatment, when I first saw her.

Examination of the knee in July, 1888, showed a complete outward dislocation of the right patella, to the outside and behind the external condyle of the femur. There was a double rotation of the tibia and femur on their long axes; the femur was rotated inward; shown by the fact that when the thighs were brought together symmetrically the inner condyle of the right femur lay behind the inner condyle of the left, and the external condyle of the right leg projected anteriorly, so as to be in the median plane of the limb, occupying the same relative position as the left patella. The tibia had been drawn slightly backward and rotated outwards, so that when standing erect with heels together the right foot made a right angle with the left.

The patella was very movable laterally. When the leg was extended the patella came to the front directly over the external condyle; and when flexed, the patella rotated around the external condyle, keeping its under surface against the condyle until it was distinctly behind the condyle, with its anterior surface external and its inner edge anterior. The first effort to flex or extend the joint was followed by this direct lateral excursion of the patella backwards or forwards around the condyle. It moved in a double arc, one of which was determined by the ligamentum patellæ as the constant radius, the other being part of the circumference of the external condyle around which it revolved.

In consequence of the rotation of the femur and tibia motion at the knee-joint was also complicated. When extended the limb showed an in-knee. Flexion of the leg on the thigh caused the foot to describe a double arc, one in which the tibia formed the radius, and the other in a plane at right angles and tangent to the plane of the first, determined, of course, by the convexity of the two condyles and the circular movement of the articular surface of the tibia around them. When fully flexed the antero-posterior plane of the leg was at an angle of about fifteen degrees to the plane of the thigh.

The patient could put weight on the leg only when it was completely extended, and extension could be maintained only by keeping the patella in front of the condyle, which was largely assisted by

wearing a rigid knee-cap, It is evident that as soon as the patella revolved about the condyle (so as to be behind the centre of movement of the tibia upon the femur) the quadriceps ext. femoris instead of acting as an extensor and steadying the leg, acted as a flexor.

On July 9, 1888, the following described operation was performed, Dr. F. M. Johnson, of this city, also being present.

An incision was made from the tubercle of the tibia, six inches upwards in the median line. The joint was opened and the patella found outside the external condyle as described. It was not bound to it by adhesions, but was so firmly held by the outer part of the capsule of the joint that it required a four-inch incision to the outside of and parallel to the tendon of the quadriceps ext. femoris and the ligamentum patellæ to liberate it. The ligamentum patellæ was found to lead off from the tibia at a decided angle.

The incision made through the capsule from the inside of the joint allowed the patella to be readily brought back to its place between the condyles of the femur. It was as much dislocated now in its new position with reference to the tibia, as it had been before with reference to the femur, on account of the rotation of the bones. An attempt was made to reduce this secondary dislocation by forcibly rotating the tibia inwards, but with all the force we could bring to bear upon it we only succeeded in partly restoring the tibia. It was left in this partly reduced condition, with the hope that the muscular traction which had produced the secondary dislocation would act, now that the patella was in its normal situation, to completely restore the secondary defect remaining, and this ultimately proved to be the case.

The operation was completed by putting two drainage tubes through the joint, and closing the wound with silk sutures. She made a good recovery; the wound healed by first intention, the tubes were shortly removed, and after three weeks passive movement of the leg began. Six weeks after the operation she could flex the knee through an arc of fifteen degrees, and was able to put her weight upon it and could walk with a cane.

I have recently examined the knee, now four years since the operation. The dislocation has never recurred. There is no excess of fluid in the joint, which works smoothly and without pain. The femur and tibia are in exact line, and there is no rotation.

She is able to walk long distances without even a cane, and without limp or hitch. She can flex the leg on the thigh through an

arc of about forty-five degrees, further motion being apparently limited by adhesions in the joint at the site of the drainage tubes. The ability to flex the joint has steadily increased since she left the hospital. The inability to flex the leg to a greater degree interferes somewhat with her comfort while sitting, and prevents her going down stairs in the usual way, as she has to go down one stair at a time, but in other respects the limb is as useful as its fellow.

CASE OF ACUTE INTERMITTENT HYDRONEPHROSIS FROM VALVULAR STRICTURE OF THE URETER.

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NIAGARA UNIVERSITY.

**B**ENJAMIN GOODMAN, aged twenty-five, tailor, entered the Sisters'-of-Charity Hospital on August 12, 1893, with the following history: He had for twelve years suffered from periodical attacks of pain in the right lumbar region without any known cause. The attacks came on about every two or three months and then lasted about a week. The pain was usually very severe, extending downwards into the thigh, scrotum and head of penis, and could be relieved only by hypodermics of morphia. The pain was ushered in by continual vomiting and general malaise, with fever and restlessness. He had noticed that the urine during the attacks was somewhat scanty (one pint in twenty-four hours) and voided with some difficulty. When the attack was over he passed urine freely and in greater quantity. The urine had never to his knowledge contained blood or pus, nor had he ever passed a concrement. Of late the attacks had become more frequent, and he scarcely recovered from one before another commenced. He had been treated by a number of physicians with alkalies, mineral waters, etc. His mother had died of phthisis; the rest of the family were healthy. By the objective examination nothing particular was discovered. He was tender from pressure in the right lumbar region, but no appreciable fulness was discovered.

The examination of urine showed specific gravity 1035, acid reaction, no albumin, sugar or bile. The color was reddish. Microscopically it contained numerous crystals of oxalate of lime and blood corpuscles, but no pus or casts. It is to be deplored that no cystoscopic examination was made, as it probably would have given important information in regard to the diagnosis. The patient had suffered

for so many years that he was anxious to have something done to relieve him of his continual misery.

The symptoms pointed to the right kidney as the seat of lesion and to a kidney stone, producing occlusion of the ureter as the probable cause.

I therefore advised an explorative nephrotomy, and performed it on August 14, 1893, by aid of the usual oblique incision. After

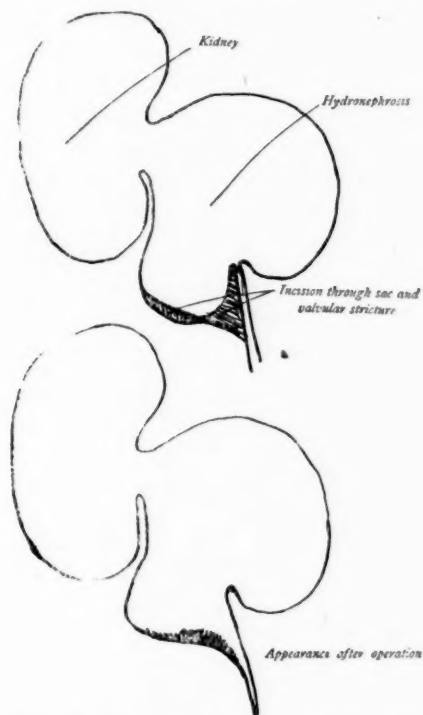


FIG. 1.—Acute intermittent hydronephrosis from valvular stricture of the ureter.

the kidney was exposed a fluctuating swelling was seen as large as an orange, below and to the inside of the kidney, containing a clear, watery fluid, and being a hydronephrosis. An incision an inch long was made in its lower end, and about half pint of fluid evacuated. The finger was introduced and the kidney explored for stone, but none found. By spreading the incision laterally the opening of the ureter could be seen plainly. It appeared as a papilla extending a quarter of an inch into the cavity. A flexible bougie, No. 14, French scale,



was introduced with ease into the bladder, showing the ureter to be permeable through the whole length. I could find no other cause for the recurrent hydronephrosis than this abnormal condition of the ureter. The kidney was not more movable than normally. I therefore enlarged the incision downward through the papilla and well into the healthy ureter, pulled the margins of the wound outward with fine hooks, and united the wound longitudinally with numerous fine silk sutures, taking in the outer two coats of the ureter and sack, and avoiding the mucous membrane. After the wound was sutured the appearance was more that of a funnel. (See illustrations.) The wound in the sack and ureter was protected with a meche of iodoform gauze for possible drainage, and the rest of the wound closed. He complained for three or four days after the operation of considerable tenderness in the lumbar region and had moderate fever. No discharge of urine occurred through the wound. The urine contained considerable blood and had to be drawn by catheter. The amount was—

17 ounces on the first day;  
 18 “ “ second day;  
 20 “ “ third day;  
 28 “ “ fourth day;  
 38 “ “ fifth day;  
 40 “ “ sixth day;

and thereafter about 40 ounces daily.

Under the use of

R. Tinct. chlor. iron . . . . . qtt. 20.  
 Fl. ext. ergot . . . . . ʒj.  
 Acid. gallici . . . . . gr. 10.  
 Glycerine . . . . . q. s. ad ʒss.

D. every four hours.

the urine cleared up and became normal, all pain and tenderness disappeared, the wound healed, and on August 29, fifteen days after the operation, he was discharged feeling well. He has since been well, gained in flesh and had no attacks. I have so far not made a cystoscopic examination to satisfy myself beyond doubt that the function of the kidney is restored.

This case is of interest in more than one way. It proves, what otherwise is well known, that incised wounds of the ureter may heal as any other wound, if carefully sutured. Fenger,

of Chicago, has published a very similar case.<sup>1</sup> He remedied the defect by dividing the valve transversely and uniting the ends of the incision by suture. In a case of stricture lower down, he made a longitudinal incision and united it transversely, similar to the operation of Heinecke-Mikulicz for stenosis of the pylorus. I united the incision in my case by longitudinal suture, as there seemed to be a superabundance of tissue after the tip of the valve had been pulled outwards.

Fenger states that valvular stricture at the "pelvic orifice of the ureter is usually caused by lateral insertion of the ureter in a dilated pelvis."

Küster, in a similar case, but with another stricture lower down, resected the stricture and united the ureter with the pelvis of the kidney. The plastic operation, however, is, as Fenger states, easier of technique.

The spontaneous evacuation of the hydronephrosis was, perhaps, due to obliteration of the valve or papilla by pressure of the fluid, when the hydronephrosis had reached a certain degree.

The usual cause of intermittent hydronephrosis (according to Ferrier and Baudouin, who have collected eighty-three cases),<sup>2</sup> is a floating kidney, causing a kink in the ureter, and thus arresting the evacuation of urine. Most of the cases, they state, became eventually permanent by inflammatory changes, which form bands of adhesions and thus fasten the kidney in its displaced position. They advise early nephrorraphy, or else nephrectomy. Judging from the successful results of Fenger's and my own cases, nephrectomy can scarcely be indicated. It is more than possible that a valvular stricture may be the cause of the acute hydronephrosis, whether there be a floating kidney or not, and that it may be remedied by nothing more serious than a slight plastic operation.

<sup>1</sup> Chicago Medical Recorder, March, 1893.

<sup>2</sup> Annual of the Universal Medical Sciences, E 28.

A CASE OF FRAGILITAS OSSIUM, WITH MULTIPLE  
FRACTURES AND VICIOUS UNION;  
DEFORMITIES CORRECTED BY  
OSTEOTOMY.

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• COLLEGE HOSPITAL.

J. F., aged eighteen years, October 28, 1890, fell on the sidewalk, and broke his right femur near the middle. He was taken to the Long Island College Hospital, where I saw him soon after admission. At ten years of age the same bone had been broken somewhat nearer the lower end. The bones of the thighs and legs of this patient were all very much deformed. The lower ends of both thigh bones were bent considerably backward, making an angular displacement near their middle. The right femur had been broken just above this bend. Both legs were bent backward so as to make at their middle an angle of more than forty-five degrees; and the toes of both feet were pointing almost directly downward. I was told that the bones of the legs had been broken, and that the fragments had united without treatment. The boy's father told me that his son had always had poor health, and that he had been subject to fits and convulsions, and that this was the cause of his crooked bones.

After the repair of the broken thigh bone, the boy took up the idea of an operation upon his legs; he wanted them straightened. I told his father that the result of an operation was doubtful, and might lead to an amputation of the legs. The boy said that he would rather lose his legs than remain as he was. My conclusion was to operate on one leg at a time.

The first operation was performed on the left leg, January 13, 1891. A longitudinal incision was made along the crest of the tibia over the angle of projection, about five inches in length, and the soft parts dissected from the sides of the bone far enough to permit

the saw to cut through it; then the fibula was fractured by force. About four inches of the bent part of the tibia was sawed out, part from the upper fragment and part from the lower. The broken ends of the pieces of the fibula were cut off, so as to permit the pieces of the tibia to be adjusted evenly, in order to make the leg straight. To attain this end several slices of the bones were cut off. The cut ends of the pieces of the tibia were adjusted and wired together with knee-pan wire. The wound was closed and drained, and all was put on a splint of peculiar construction. Union was very slow, taking five or six months. I removed the wire the next October.

In the first week of June, 1891, while going about the yard of the hospital on crutches, he fell and broke his right femur again near the seat of the previous fracture. The process of repair took place in about six or seven weeks. It is worthy of mention that he was an inveterate smoker; I urged him to stop smoking, as it was doing him harm; he left it off, and has not smoked since, his general health having improved in the meantime. About the 1st of August, 1891, while in the surgical ward of the hospital, he fell and broke his right femur once more. The same treatment as employed before was carried out; the limb was laid on and over a pillow, making the thigh as straight as possible under the circumstances; and a traction weight of about six pounds was applied in the usual way. Union took place in about five or six weeks.

The operation on the right leg was performed January 13, 1892, and the steps were similar to those of the one of the previous year. In this instance the fibula had fused with the tibia, and did not require a separate exsection. The same kind of wire was used as before. The wound was closed more completely than in the previous case, by means of deep sutures, thus assuring more speedy union of the soft parts. There was good union of the pieces of bone in about two months.

The splint used in both instances was my modification of Dupuytren's splint for Pott's fracture of the leg. It had a piece of wire-cloth fastened to the posterior edge, and bent up so as to make a trough splint. The board-piece came on the inside of the leg. The apparatus had posterior and external splints, as it were; while the foot-piece supported the foot and the lower fragment of the leg.

## TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

*Stated Meeting, October 11, 1893.*

CHARLES K. BRIDDON, M.D., Chairman, *pro tem.*

### LATERO-INTESTINAL ANASTOMOSIS FOR NEOPLASM.

DR. L. A. STIMSON presented a man, fifty-seven years of age, who was admitted to the New York Hospital July 15, 1892, with the history that for some years he had been suffering more or less from chronic constipation, and for about three months before admission from attacks of severe pain in the left side of the abdomen, to which little by little was added considerable abdominal distension. For the last four weeks the bowels have moved only by enema. About two weeks before the speaker saw him he entered another hospital in the city because of abdominal distress, and about a week before he left there and entered the New York Hospital he vomited dark-colored matter and his general condition deteriorated markedly. When the reporter saw him his condition seemed very serious. The pulse was 120, the temperature 103°; there was persistent vomiting and belching; he was unable to retain food, and had had no movement from the bowels for a week. The history pointed to structural obstruction of the bowel on the left side, probably in the sigmoid flexure, and his condition was so low that it was deemed advisable at first only to relieve the obstruction by making an artificial anus in the right groin, opening the cæcum. This was followed by gradual improvement in his symptoms and condition. On August 10, nearly four weeks later, his condition was so far improved that it seemed proper to attempt permanent relief of the intestinal obstruction which was believed to be located in the sigmoid flexure. The deposit of fat in the abdominal walls was too great to permit satisfactory physical examination. A free incision was made along the left linea semilunaris, and the sigmoid flexure was found to present a solid mass about the size of the fist, presenting the general appearance which we are

accustomed to see in carcinoma of the intestine. This mass was so large and so firmly bound down to the posterior parietes that it was thought inadvisable to attempt its removal, and he contented himself with an anastomosis between the left portion of the transverse colon and the upper end of the rectum.

It was made without plates, by long, free incisions, binding the edges of the two orifices together, and was satisfactorily accomplished. The artificial anus in the right iliac region was retained, of course. Primary union took place, and on August 28, eighteen days after anastomosis, the man passed a large-formed movement per rectum, and this was followed by daily movements. On<sup>27</sup>September 9 he closed the opening in the right side, and on October 2 the man left his bed, and on the 15th left the hospital. Since then<sup>5</sup> he has enjoyed good health, as his appearance indicates. He is a professor of music, and is regularly engaged in his professional duties. He says that he feels better than he has for years. Manual examination of the abdomen reveals nothing, the walls being very thick.

The striking point in the case is that the man should have been so well and so comfortable for fifteen months after the operation with the epithelioma, which was evidently the nature of the tumor, still remaining. Whatever the future may bring, his present condition gives no indication of the presence of the malignant growth in the sigmoid flexure. Of course, it is possible the disease is not cancer, but it presented all the ordinary appearances of cancer.

In connection with that case he referred to another in which the same diagnosis was made. He exposed and recognized a tumor within the abdomen of the man, supposed to be malignant disease of the transverse colon, so extensive and so matted to other parts by adhesions that he refrained from further interference and closed the wound.

As there were no obstructive symptoms, lateral anastomosis was not done. A few months afterward the patient returned to the hospital with symptoms of obstruction. One of his colleagues opened the abdomen and established lateral anastomosis. More than two years have since elapsed, and the man is still in good health, although he has lately shown some symptoms of obstruction.

Such results indicate that the field for lateral anastomosis should not be restricted to cases in which removal of the cancer is impossible, but that the average survival may perhaps be greater if it is made use of also in cases in which removal is difficult although practicable.



ARTHROTOMY FOR IRREDUCIBLE DISLOCATION OF  
THE ELBOW.

Dr. STIMSON presented a second case, a lad of nine years, who was admitted to the New York Hospital October 3 last, having come from the country with the history that the previous day he had fallen from a hay cart and had suffered dislocation of the left elbow. A physician gave him ether and attempted to reduce the dislocation, but the attempt failed. Another attempt was made without ether, and then his parents brought him to the city. Here again, before the speaker saw him, an attempt was made by the house-surgeon to reduce the dislocation under ether, and that failing he was sent for. On examination it was evident that there was a dislocation of both bones of the fore-arm backward at the elbow.

The lower end of the humerus could be felt in the fold of the joint, entirely subcutaneous and apparently denuded of all its attachments to the soft parts. No radial pulse could be felt, and there were certain signs of either defective innervation or loss of power in the muscles which move the wrist. The boy was anæsthetized, and when it became evident that reduction could not be effected in the ordinary way, he at once proceeded to expose the dislocation by an incision of which the scar was evident upon the inner side of the joint. On making this incision in the skin, carrying it down to the fascia, the lower end of the humerus came in sight entirely stripped of all its attachments to the soft parts, and presenting through a longitudinal slit in the enveloping fascia. Across the lower end of the humerus, between the capitellum and the trochlea, ran the uninjured brachial artery. The tendon of the biceps lay behind the external condyle. The brachialis anticus was torn. By passing a blunt hook over the outer side of the lower end of the humerus and engaging it under the tendon of the biceps, he was able to bring back that tendon and the associated soft parts, and then brought back the soft parts on the inner side, united the fascia by suture and closed the wound.

The wound healed primarily, and three weeks after the operation the arm was taken out of the plaster splint and the boy was instructed to use it. The gain in function has gone on steadily until at present there is complete extension, flexion within a right angle, complete pronation and partial supination. The case is interesting because of the extensive dislocation of the bone and denudation of the lower end of the humerus, with complete escape of the median nerve and the brachial artery.

## HYSTERICAL BLUE OEDEMA.

Dr. A. J. McCosh presented a patient with the following history: Age, twenty-eight. Married at age of twenty-five. Had always been a healthy girl. Her mother was a nervous woman. Nine months after marriage her husband was killed in a railroad accident and she was much prostrated by his death. In August, 1891, while in a swimming match, she was seized with cramps and was carried out of the water. Three weeks later she began to complain of sharp shooting pains in left breast. A few days later she had a convulsion. For the next three months she continued to have convulsions averaging two a week, and during this time the breast increased in size and was very painful. She then went into a hospital and an opening was made into the breast February, 1892, and she says pus came out, although the hospital report says no pus was found. In April, 1892, she entered another hospital, and from a photograph taken at that time it appears that the left breast was very much enlarged, appearing swollen and oedematous, soft and cyanotic. On the left hand and forearm are the same oedema and bluish color. The oedematous parts are cold to the touch. The breast is very hyperæsthetic and this extends over the shoulder. Anæsthesia of the anterior surface of left arm and forearm. During the next two months she had occasional convulsions, and they often were followed by a local paralysis and areas of anæsthesia on arm, hand, forearm, and leg, loss of speech and hearing.

She then left the hospital.

The next account of her is in May, 1893, when she entered another hospital on account of a "painful growth in left breast," and here the remaining portion of breast was removed. (She says it was removed in thirteen operations.)

In July, 1893, the right breast was removed in another hospital, supposed to be a malignant growth.

Dr. McCosh first saw the patient two months ago, when she came to the Presbyterian Hospital complaining of pain in the cicatrix of the right breast. In the centre of the cicatrix was an oval, deep ulcer, two inches long, filled with unhealthy looking granulation tissue. As the diagnosis of sarcoma had been sent with the patient, I presumed it was a recurrence and excised the ulcer. On microscopical examination there was nothing but granular and inflamed tissue. She has been in the hospital ever since and has had a number of the blue oedematous spots on arms and legs, some of which

have broken down, as is now the case with one on the arm. She has had no convulsions or paralysis, but has large areas of complete anæsthesia to pain and touch on back, arms and legs. A part of the history has been published by Drs. Shaw and Duryea in the *Brooklyn Medical Journal*, May, 1893.

#### PLASTIC OPERATION FOR RESTORING THE BRIDGE OF THE NOSE.

Dr. FRED. LANGE presented a woman about thirty-five years of age in illustration of the method he had practiced for reconstruction of the bony bridge of the nose. The method consisted in making a vertical incision beginning on the upper part of the forehead and extending almost to the apex of the nose, the soft parts being then dissected back on both sides sufficiently to lay bare a small area of periosteum, from which the flap was taken with a thin shell of bone, corresponding to the length of the bony bridge which one was about to form. Over the flap which has been turned down from the forehead the soft parts are united. Dr. Lange said the method was similar to others which had been devised for this purpose, especially that by Wolf, who leaves the flap covered with the entire thickness of the integument, consequently making the bridge of the nose easily too high and leaving no indentation where one normally exists, at the os frontis. The patient who was presented had once been submitted to a procedure which had been recommended by Dr. Weir a year previously; that is, she had worn a platinum frame or support to the soft parts for about a year, but had to discard it on account of discomfort and ulceration. The operation performed by Dr. Lange was a comparatively simple one, and when no ulceration took place, would, he thought, offer a lasting result. In the present instance a small piece of the lower end of the bony flap ulcerated and came away, leaving a slight depression near the tip of the nose. Dr. Lange had resorted to this procedure in one other case in which there had been destruction of bone, cartilage and soft parts to such an extent that the small rudiment of the nose was depressed into the nasal cavity and the periosteal layer had to be imbedded between the soft flaps, which had been formed from the soft parts. In that case, also, there had been some ulceration, perhaps in consequence of chiseling into the frontal sinus, and some spiculæ came out, but so far as the bony bridge of the nose was concerned the result had been very satisfactory.

## FOREIGN BODIES IN THE APPENDIX VERMIFORMIS.

Dr. F. H. MARKOE presented specimens of foreign bodies from the appendix vermiformis in two cases, the body being in one instance a black pin, in the other a faecal concretion of considerable size. The latter specimen was found in the case of a prize fighter who had only three days before "fought a fight to the finish," as he expressed it. He had never before had an attack of appendicitis. The operation was done on the third day. The appendix lay behind the caecum, and the gangrenous patch at the site of perforation was close to its proximal end.

## RENAL CALCULUS, NEPHROTOMY.

Dr. L. A. STIMSON presented a heart-shaped renal calculus, measuring an inch in its greatest diameter, having a rough surface, the roughness being particularly marked at one end by pointed and laminated crystals. It had been removed from a lad of seventeen years who had suffered five years with a dull, constant pain in the left loin. In May, 1892, after exposure to wet, cold and fatigue, the pain became very severe, and was followed by chill and the appearance of blood in the urine. His physician diagnosed acute Bright's disease, and there was a large amount of albumin and also tube casts in the urine, which seemed to justify the diagnosis. He remained under treatment until the latter part of July of this year, when he came under Dr. Stimson's care. The history seemed to point to calculus of the kidney—pain, blood in the urine, exacerbations on exercise. But no enlargement of the kidney could be felt. He made a diagnosis of pyelitis with probable calculus, and advised an operation, which was performed about the first of August. The kidney was freely exposed and appeared normal. A round needle was introduced, the stone was felt, the kidney was then divided along its convexity with the Paquelin cautery, the foreign body was removed and the patient made an uneventful recovery, the wound being healed in three weeks.

## EDITORIAL ARTICLES.

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### KLEMM ON THE TREATMENT OF FRACTURES INVOLVING JOINTS.<sup>1</sup>

IN the therapy of fractures involving the joints there is unanimity of opinion upon one point—that by a continuous immobilization a cure is very problematical. If the patient is to regain good functional use of the joint there must be a proper balance in the treatment between rest and motion; rest of the broken bone; motion of the joint, muscles, tendons and fascia—how these conditions are to be obtained is the subject of much controversy.

In all joint fractures, as well as in most par-articular fractures, there occurs an extravasation of blood into the joint cavity and into the surrounding parts. The pathological changes which subsequently result are dependent upon the hæmatomata.

To these changes belong

(1) Difficulty in placing and retaining the fragments in good apposition.

(2) Changes in the joint cavity:

(a) Thickening and toughening of the synovia.

(b) A growing together of the intra-articular parts of the joint surfaces by means of newly-formed connective tissue (ankylosis).

(3) An increase in density and cicatricial changes in the par-articular tissues.

(4) Obliteration of the tendons in their sheaths.

(5) Nutritive changes in the muscles.

(6) Pressure and disintegration of the nerve trunks, and, as a consequence, a possible neuritis with resulting disturbance of nutrition of bones and joint which result in deformities.

<sup>1</sup> Paul Klemm (Riga), *Sammlung klinischer Vorträge*, No. 78, September, 1893.

(7) Hydrops of the joints as well as a firm oedema in the par-articular tissue.

We can thus see how the presence of intra- and par-articular hæmatomata may affect the prognosis; and it is clear that these extravasations should be removed as soon as possible. What means have we at our command to accomplish this result, and how shall we use them?

The therapeutic measures for the removal of such masses may be divided into two classes: The bloody and the non-bloody. To the first of these belong

(1) Puncture of the blood tumor and its removal, with or without subsequent irrigation.

(2) Incision into the mass and its removal; with this may be classified also the suture of the bony fragments.

Under the non-bloody modes of treatment are

(1) Compression.

(2) Massage.

The first method would appear to be of chief value in those cases only where there is such large extravasation of blood that gangrene of the distended soft parts is to be feared. Just as incisions are made into infiltrated tissues so that the relief of existing pressure will prevent subsequent occurrence of necrosis.

The method of incision with subsequent suturing of bony fragments is to be reserved for cases where there is already an injury to the soft parts, or where the injury is so extensive that a reposition and coaptation of the fragments of bone is impossible without suturing. At any rate, it seems unjustifiable to suture the bone at the outset in a simple fracture before it has been determined that any other mode of treatment will give bad results.

Massage and compression are the factors which, when combined with active and passive motion, play the most important rôle in the treatment of joint fractures. Massage fulfills both indications for a rapid absorption and prevention of atrophy. Degeneration and new growths are also restricted by massage. Compression acts more



in a passive way. Massage increases the circulation in the affected region, new tissue formation is favored, and the veins and lymphatics are rendered more patent, so that the extravasated fluid is pressed by the manipulations directly into these and so carried away. Compression aids these results by increasing the *vis a tergo* in the time between the use of massage and so serves to increase absorption.

Hand in hand with these manipulations active and passive motion should be used, which should vary in extent from time to time and thus, by changing the points of contact, prevent degenerative changes in these parts.

As frequently happens in the use of a new method, some have gone to the other extreme and recommended an entire absence of splints and immobilization and entire reliance upon massage and motion. This is certainly wrong. The broken bone needs rest and this indication must be met by the use of splints and bandages, and a proper position. Of course, cases vary greatly, and good judgment must be used to give to each form of treatment its proper relative value.

H. P. DE FOREST.

#### SOKOLOFF ON FIBROMA ARBORESCENS OF THE JOINTS.<sup>1</sup>

RECENT opportunities for operative investigation have shown that papillomatous growths are a very common complication of chronic rheumatism. Formerly these extensive growths were thought to be extremely rare, and Schmolck, in writing upon the subject, could report but two cases occurring in von Volkmann's clinic. Since Schmolck's article appeared a few scattered cases have been reported, most of them being tubercular in character. Riedel even maintains that such papillomatous growths are the result of the slight irritation from old tubercular deposits. M. Schueller considers the papillomata to be the result of a chronic inflammatory irritation, and calls attention to the fact that they are present in various pathologi-

<sup>1</sup> N. A. Sokoloff, St. Petersburg: Sammlung klinische Vorträge, No. 81, September, 1893.

cal conditions of the joints, *e.g.*, syphilis and arthritis deformans. Schueller's publication shows that papillomata appear but seldom in cases of rheumatism, and, although more frequently observed in arthritis deformans, the growths are either in the form of a single papilloma or appear as a circumscribed collection of papillomata arising from some part of the synovial membrane. Still more rarely are the growths found in tuberculosis. It must be concluded from the existing data that papillomata may be the outcome of a simple inflammatory irritation in various diseases, but that the variety to which Mueller has given the name "*lipoma arborescens*" is not frequent. The question why the presence of inflammatory irritation is not always characterized by the development of papillomata, appears for the present unanswerable. The object of the present article is to show that inflammatory irritation is not the sole cause for the development of these tumors.

It has long been known that papillomata can occur upon a normal synovial membrane. In opposition to C. Hueter, who considers all papillomata as pathological growths, O. Hagen-Torn has demonstrated that they occur as entirely normal structures in both man and animals. M. Schueller shares completely this view, and adds, "that under normal conditions they are few in number, and are never so large that they can be felt from outside the joint." The growths are not scattered all over the synovial sac, but are usually found in certain places. They develop from the synovial membrane, and their structure remains identical with that of the membrane from which they arise. During the period of development the synovial coating becomes differentiated from the underlying tissue so that in some places it entirely disappears, in others it becomes thinner, and again forms papillomata. The disappearance of the synovial membrane occurs in those places where the pressure is greatest, as upon the surface of the cartilage; in places where the pressure is somewhat less the membrane merely becomes thinner; where, however, a negative pressure exists papillomata are found upon the membrane. Since under normal condition negative pressure can exist in but few places

in the joint, papillomata can occur only in quite restricted localities. Aspiration, by increasing the negative pressure, markedly increases the number of tumor masses.

The papillomata, like the synovial membranes, are formed from connective tissue. They rest upon pedicles of varying thickness, and hang free in the joint cavity. They often divide and subdivide, and are then apt to be pyriform in shape. These last contain loops of blood-vessels, the more vascular forms containing fat cells in abundance, while those less freely supplied with blood often contain cartilage cells. The polyp cells are identical with those of the synovial membrane, though the ground substance in which the cells lie is usually more delicate in structure. A bundle of thicker connective tissue is frequently found lying as a sort of axis in the mass, and sometimes there are secondary and more delicate fascicles lying parallel with it.

In those joints where the intra-articular pressure is subject to wide variations, the conditions for polyp formation are especially favorable, negative pressure being the chief factor in their development. The less yielding parts of the joints, such as the cartilage and ligaments, together with such soft parts as are in frequent motion, are not affected by negative pressure, and hence show no papillomata. Where, however, the tissues are movable, and of a looser texture, absorption is easier, negative pressure easily occurs, and polyps are frequent. That friction (to which was formerly assigned an important rôle in the etiology of papillomata) is unimportant, is shown by the fact that these polyps develop only at those places where the rubbing during joint movements is at a minimum.

These facts are well illustrated by the following histories of two cases coming under the author's immediate observation :

CASE I.—A woman suffering from syringomyelia was treated for a diseased condition of the shoulder joint. The joint was opened and there escaped from the incision a mass of papillomata which originated from the lateral part of the capsule only—a part which, as the subsequent examination showed, was without function at the time.

After the humerus was drawn downward it was found that the joint cavity was greatly distended; the head of the humerus and the glenoid fossa had disappeared entirely, and the capsule was stretched and in some places markedly thickened. The inner surface of the lateral wall was completely covered with polyps varying in size from a millimetre to a centimetre in diameter. The remainder of the synovial membrane was smooth. For some time before the operation there had existed a dislocation of the shoulder inward and upward, which could easily be reduced, but which immediately recurred as soon as the arm was left to itself. The patient could move the arm to a limited extent, but to reduce the luxation herself by mere muscular contraction was impossible.

Microscopical examination showed the usual structure of hypertrophied papillomata, with the exception that so much fat was present that the name "*lipoma arborescens*" was entirely applicable, the masses appearing for the most part like true lipomata. The blood-vessels in the polypi were numerous and well developed.

It is to be noted that the growths occurred only on that portion of the capsule which had ceased to functionate, and which from the nature of the dislocation was subject to negative pressure.

CASE II.—The patient, a man sixty-five years of age, died in the hospital at Moscow in 1888. Fifteen years before he had dislocated his right shoulder. It was reduced, but was again dislocated two years later, and this time remained unreduced. The patient was able to resume his work, and to move his shoulder slightly; after a time the shoulder became somewhat movable. He came to the hospital on account of œdema of the lower half of the body, and a swelling of the right shoulder and elbow. A fistula appeared near the elbow, from which a moderately turbid fluid escaped. A small fistula was also observed over the shoulder joint, but it was not possible to enter the joint with a probe. The elbow became ankylosed, but the shoulder, though badly deformed, remained movable. The patient was under observation for some time, but the cause and character of the swelling remained unexplained. He finally died suddenly.

Extreme pulmonary emphysema, complete obliteration of the pericardial sac, and extensive changes in the elbow and shoulder joint, were found post-mortem. In the elbow there had been an inflammatory process leading to ankylosis. The head of the radius was grown fast to the humerus; the ulna was also united to the humerus by firm fibrous bands. The capsule of the joint was thickened, and in places adherent to the bones.

The capsule of the shoulder joint was intact, but uniformly thickened. Upon opening the joint in front, the head of the humerus was found to be dislocated, and lying immediately beneath the acromial end of the clavicle. The head of the humerus had become somewhat egg-shaped, and was covered with turbid cartilage. The head was not found in the normal joint groove, which was completely covered with a fibrous scar tissue, and badly deformed as a result of the former rupture, but was in a new groove, more inward and above, and nearer to the acromial end of the clavicle. The broken-off end of the coracoid process, surrounded by a fibrous mass, lay behind this groove. This newly formed groove was surrounded by a soft fibrous mass, and about the middle of the end was a small ulcer, corresponding to a similar sized ulcer upon the altered cartilage, covering the end of the bone. In the posterior corner of the capsule behind and outward from the newly formed groove, and behind the head of the humerus, was a large conglomerate mass of polypi passing in part over the posterior section of the bone like a definitely formed wall, as far as the border of the cartilage. These papillomata were soft, showed nowhere cartilaginous or bony thickening, and were very variable as regards size and shape. A few single polyps were found here and there in the joint, but they were flat, compressed, and nowhere formed such a thick conglomerate of papillomata as in the angle behind the bone. A few polyps were even found upon the head of the humerus at the points of greatest turbidity and thickening of the cartilage.

Microscopically, the usual structure of hypertrophied polyps was found, with numerous blood-vessels. The amount of fat in the

masses was insignificant, and cannot be compared with the first case mentioned.

In this case also, as a result of the long-standing unreduced dislocation of the humerus, a portion of the joint ceased to functionate; here, too, a negative pressure existed, and here there developed a mass of papillomata. That there existed a chronic inflammatory process, probably rheumatic in character, is rendered likely by the ankylosis of the elbow joint, and this could readily account for the scattered single papillomata in the shoulder joint; such single growths are sometimes found in completely normal joints—they have little significance.

This case, too, can only be explained by the existence of negative pressure in the joint. In both cases the polyp formation was sharply limited. In the first case the complete absence of any inflammatory irritation enables this factor in the etiology to be excluded. In the second case the inflammatory processes would have some consideration as an etiological factor did not the long duration of the process (nearly thirteen years) exclude them. If this be admitted as the cause, why did the growths limit themselves solely to that portion of the capsule whose function was lost? The time of progress of the disease was long enough to have covered the entire synovial surface with similar growths. The two cases show that, besides the inflammatory irritations in certain diseases, the variations in intra-articular pressure alone may act as the sole cause of such growths.

H. P. DE FOREST.



## REVIEWS OF BOOKS.

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THE ANATOMY AND SURGICAL TREATMENT OF HERNIA. By HENRY O. MARCY, A.M., M.D., LL.D. Quarto, 421 pages. New York: D. Appleton & Co., 1893.

One is impressed in turning over the leaves of this book that the author has put his own individuality into it to a marked degree, and that in the clear, large type, the broad margins, the thick paper, the reproductions of plates that had illustrated the books on the same subject by writers of previous generations, there is simply an expression of the dignity in the author's own mind which the subject of hernia has held, which he has thus striven to communicate to the book itself. The author has evidently been a student of the literature of the past, and the pleasure which he himself has received in scanning the pages of Cooper, Scarpa, Cloquet and others, he has hoped to give to others in turn by reproducing for this generation much of the work of these old masters as an introduction to a critical study of the present state of knowledge and practice in the surgery of hernia.

For more than twenty years Dr. Marcy has been enthusiastically interested in the possibilities which the new surgery has opened for the relief of hernia. The questions of disinfection, of drainage, of special methods and materials of suture have from time to time engaged his attention, and in his numerous writings and addresses have been already brought to the attention of the profession. In the present volume, however, they are all brought to bear upon the one subject, the management of hernia. In some measure, certainly, the present volume must be considered as the crown of many years of active professional life. Its conclusions are those of a mature and experienced surgeon, and hence gain in both interest and weight.

The author accepts the estimate that between one-eighth and

one-sixteenth of human beings are the subjects of hernia, and that a mortality of 1 to 600 of deaths is attributable to it. He has essayed to present a complete treatise on the subject, limiting himself, however, with one exception, to those forms of hernia which produce an external tumor. This exception is that of diaphragmatic hernia. That he should have excluded from any systematic consideration the various forms of internal retro-peritoneal hernia must be a source of regret, for it unquestionably detracts from the completeness of the work as a treatise upon hernia. There is given a list of ten varieties of external hernia, but neither in the list nor in later discussions is any reference made to the important varieties of inguino-properitoneal and of lumbar hernia.

Chapter II takes up the anatomy of the parts involved in inguinal hernia. This chapter is illustrated by reproductions of plates from Darrach, Cooper, Bourgery, Morton and Guthrie. Quotations from Scarpa, Cooper, Warren and Lawrence are freely used to give thoroughness to the descriptions of the parts.

Chapter III deals with congenital hernia. The original description of Pott is quoted at length; a description of specimens in the Museum of the Royal College of Surgeons of England is given, and a case is detailed, reported by Hulke, which presented some unusual features.

With Chapter IV begins his discussion of inguinal hernia, a topic which, in its various phases of anatomy, varieties, complications and treatment, occupies this and the three succeeding chapters. They are abundantly illustrated, and contain many references to and extracts from the writings of others. The critical reader might complain of a certain diffuseness of style and lack of systematic arrangement of the matter, but this is compensated for by the general interest of the matter presented, and, inasmuch as the book is one for the reference of the experienced practitioner rather than for a guide to the student, this feature is readily forgiven. A more important criticism is that the author, by the preponderating place which operative means for the relief of hernia assume in his thought, is led to assign

altogether too small a space to less radical measures of treatment. Trusses receive a very brief consideration. The value of trusses in the treatment of the herniæ of children, the possibilities of securing permanent relief by the use of a truss in cases of recent rupture engage but little of his attention. Since undoubtedly the great mass of the ruptured will continue to depend upon trusses for relief, a more full discussion of this aspect of hernia might have been looked for.

For irreducible inguinal hernia, as a class, the author recommends operative measures, a recommendation from which few, if any, surgeons of the present day will dissent.

The subject of herniotomy, as an operation, is considered in connection with the treatment of strangulated inguinal hernia. The author urges that no operation should be considered finished without making an attempt at permanent cure. The method which he advocates consists in freeing and drawing down the sac, suturing it as deeply as possible and excising the redundant portion, lifting up the cord and drawing it to the outer angle of the wound, closing the internal ring by deep sutures as snugly as possible without strangulating the vessels of the cord, permitting then the cord to fall into its place in the restored inguinal canal, and, lastly, closing the superficial layers of tissue over the cord by suitable buried sutures, without drainage. He uses kangaroo tendon as a suture material and employs the subcuticular suture for the skin.

In succeeding chapters the remaining varieties of hernia are each more or less fully discussed. The chapter on umbilical hernia is especially satisfactory and is one of the best in the book. Prominence is given to the operative cure of this form of hernia, and the opinion is expressed that the time is not far distant when the cure of this oftentimes disabling and dangerous condition will be considered as safe and simple as an exploratory laparotomy.

In the chapter on diaphragmatic hernia an endorsement is given to exploratory incision and to attempts at closure of the opening in the diaphragm, coupled with the statement that the author has not

been able to find record of any instance in which such attempts have been made. An examination of a file of the *ANNALS OF SURGERY* for three years back would have given him reports of three such cases, two reported by Dalton, of St. Louis, in Vol. ix, 1889, p. 93, and one by O'Dwyer, of New York, in Vol. xi, 1890, p. 124.

The last six chapters of the work are devoted to the discussion of the operative cure of hernia. In these are given the earlier methods of dealing with hernia, followed by quite full accounts of the recent work of both European and American surgeons. It is evident that the author has aimed to acquaint the reader with everything of value that has been proposed in this field; for this purpose he has introduced many and extended quotations from the writings of the operators referred to, so that one who has read this work may feel that he is fully acquainted with all that had been proposed for the relief of hernia up to the time of its going to press. At the close of these quotations the author expresses himself as believing that they show that operation for the radical cure of hernia is justifiable in a very wide range of cases, and that when done under the technique of aseptic surgery it involves risks no greater than those which attend the minor operations of surgery. He sums it up in the statement "that there can be little doubt that the surgery of the future will include a large percentage of the sufferers from hernia which the conservative surgery of to-day relegates to the truss-bearing army of invalids."

We think, however, that Dr. Marcy lays himself open to the fair criticism of somewhat overrating the amount of invalidism which the average truss-wearer is the subject of, and of underrating the difficulties and risks which are inherent in the operations proposed for its cure. Nevertheless his book, though aggressive and positive in its surgical aspects, is decidedly judicial and comprehensive in its statements of facts, and cannot fail to infuse sound and intelligent views as to the management of the disability of which it treats.

L. S. PILCHER.

DISEASES OF THE RECTUM AND ANUS, THEIR PATHOLOGY, DIAGNOSIS, AND TREATMENT. By CHARLES B. KELSEY, A.M., M.D. Fourth Edition, Revised and Enlarged. Octavo, 496 pages. New York: William Wood & Company.

The fourth edition of this standard work which has recently appeared, incorporates many new facts which have been deemed important as a result of the author's increased practical experience. The value of the book is thus considerably enhanced.

The book is filled with practical suggestions, some old, some new, all valuable. Thus, in the chapter devoted to examination and diagnosis, the writer says: "The practitioner who attempts to treat a disease of the rectum without first making a direct examination, uselessly risks his reputation as a diagnostician; and in my practice I am guided by the simple rule that patients, male or female, who have not yet come to the point which makes them willing to submit to an examination, have not yet reached a point which admits of treatment." This is a statement equally applicable to other classes of disease, and which, if remembered and adhered to, would save many a practitioner much subsequent trouble. "The secret of successful diagnosis in these diseases consists in taking nothing for granted." "It is often necessary to devote an hour or more to the first examination of a patient; but no patient should be allowed to end his first visit until a diagnosis has been made, or the surgeon acknowledges to himself his inability to make such a diagnosis." "Never trust your diagnosis to the history given by the patient alone." These statements are axiomatic, they are, perhaps, trite, but medical men will agree that they cannot be repeated too often, and that they should ever be borne in mind.

The mooted question as to the existence or non-existence of a third sphincter muscle is discussed and various authorities cited. The author's summary of the case is as follows:

(1) What has been so often and so differently described as a third or superior sphincter ani muscle, is, in reality, nothing more than a band of the circular muscular fibres of the rectum.

(2) This band is not constant in its situation or size, and may be found everywhere over an area of three inches in the upper part of the rectum.

(3) The folds of mucous membrane (Houston's valves), which have been associated with those bands of muscular tissue, stand in no necessary relation with them, being also inconstant, and varying much in size and position in different persons.

(4) There is nothing in the physiology of the act of defecation as at present understood, or in the fact of a certain amount of continence of fæces after extirpation of the anus, which necessitates the idea of the existence of a superior sphincter.

(5) When a fold of mucous membrane is found which contains muscular tissue, and is firm enough to act as a barrier to the descent of the fæces, the arrangement may fairly be considered as an abnormality, and is very apt to produce the usual signs of stricture.

The ætiology, clinical history, and diagnostic appearances of the various forms of hæmorrhoids, are set forth in a chapter on that subject. The value of the text is enhanced by a chromo-lithograph and numerous other illustrations. Much stress is laid upon the technique of examination. The various forms of treatment are described in detail. Carbolic acid injections, which have been used by many irregular practitioners and charlatans with success in some cases, have been tried systematically by Dr. Kelsey, who has done what he could to place this method of treatment upon a recognized basis. The advantages of this procedure are given due credit, but the disadvantages so much outweigh them that the author has practically abandoned the operation "as being neither radical nor certain in its results." As between the clamp and cautery and the ligature, while admitting that either operation gives good results, the former is preferred chiefly on the ground of its comparative freedom from post-operative pain and discomfort. The "Whitehead" operation is mentioned only to be condemned. "The method seems to have lasted a short time as a surgical curiosity, and now to be almost abandoned"—a statement with which many surgeons will not agree.



Other chapters are devoted to abscess, fistula, prolapse and invagination, proctitis and periproctitis, congenital malformations, venereal diseases of the rectum and anus, constipation, faecal impaction, pruritus ani, wounds and foreign bodies, spasms of the sphincter and neuralgia. The three first mentioned receive more attention than the others. In each chapter are given appropriate reports of cases gleaned from many reliable sources. Similar clinical records are found throughout the book, and constitute one of its chief merits.

The more serious forms of disease—ulceration, stricture and non-malignant new growths—are well presented. The chapter upon malignant new growths, however, has not received the attention that its importance demands. Though, as a rule, the book is well illustrated, the important subject of the pathology of cancer has but two illustrations, and one of these is, perhaps, diagrammatic. The clinical history of the various forms of cancer found in this part of the body is clearly described, but the differential diagnosis, as determined by the appearance under the microscope, is barely mentioned.

As to the treatment of cancer, the author says: "In the surgical treatment of cancer it must be plainly understood that none of the means mentioned under non-malignant stricture—neither cauterization, division, dilatation, divulsion, nor electrolysis—have any place. The resources at our command are only two—extirpation and colotomy. One of these should be performed as soon as the case comes under observation, and all other interference with the growth abstained from. I know of nothing better calculated to fill a *surgeon* with disgust than the story of some poor sufferer that somebody has been using a speculum two or three times a week, and applying caustics to his cancerous rectum. Not only is this kind of treatment harmful by increasing the rapidity of the growth, but it is also much more dangerous than one without experience would believe. It has long been excellent surgery, either to remove a cancer completely or else let alone." This is sound surgical doctrine, and it is a pity that all surgeons do not apply it to other conditions as well—notably in cases

of cancer of the breast. Both modes of procedure are discussed. The results of excision at the hands of Bilroth, Volkmann, Velpeau, Weir, and other eminent surgeons, are given, as well as results where colotomy was the chosen operation. The author himself prefers colotomy, and one of the best chapters in the book is the one devoted to the formation and closure of artificial anus.

Though the book has much to recommend it to the profession, and is at the present time, perhaps, the best book on the subject in the English tongue, still there are two grave faults evident in it which may justly be made the subject of adverse criticism. One of these is the lack of sufficient details in the operations described. A person called upon to do an operation upon the anus or rectum, would naturally expect to find in a truly scientific work, devoted exclusively to diseases of these organs, a full and detailed account of the operation, together with its indications, its contra-indications, the precautions to be taken, and the complications which may arise. Other similar operations, devised by different men for the relief of the same condition, should receive equal consideration, and an unbiased opinion of the relative merits of each be given. This is not the case in Dr. Kelsey's book. The fact that different men vary in their operative ability in different operations is not sufficiently recognized. One or two operations are described *in extenso*; others, which by many men are held to be of equal value, are slighted. At times, too, the reader feels that personal prejudice has been given undue weight.

Another fault is the intolerance shown of the opinions of other surgeons when they differ from the views of the writer. To make sarcastic comments because Senn does not favor colotomy, or to ridicule Whitehead for preferring his own operation, does not add to the value of the book.

HENRY P. DE FOREST (Brooklyn).

**LEHRBUCH DER SPECIELLEN CHIRURGIE für Aerzte und Studirende.**

Von Dr. FRANZ KOENIG, Ord. Professor der Chirurgie, Geh. Med.-Rath., Director der Chirurgischen Klinik in Göttingen. Sechste auflage, 1 Band, mit 139 Holzschnitten. Berlin, 1893: Verlag von August Hirschwald. (Text-book of Special Surgery for Physicians and Students. By Dr. FRANZ KOENIG.)

No treatise on surgery has attained a greater success in its own country than has the work of Koenig among the German-speaking nations. It stands as a monument to one of the most thorough teachers and indefatigable workers of the German school. Although the work is used largely by students, it is pre-eminently valuable as a book of reference for practitioners of surgery.

This first of the three volumes of the sixth edition of the Special Surgery promises to bring the work thoroughly up to date, and comes from the press within four years after the appearance of the fifth edition. In his prefatory remarks the author states that the intention to have the first two volumes appear together had to be given up, for the second volume deals with the surgery of the abdomen, and since the year 1889 so much literature upon this subject has appeared, all of which must be gone over, that the second volume goes to press as the first is put on the market.

This first volume, a work of 700 pages, deals with the diseases of the head and neck. Beginning with the injuries of the scalp, skull and brain, it goes on systematically with diseases of these parts. The next chapter is devoted to injuries and diseases of the face in general, taking up in order injuries, inflammations, tumors, neuralgia and nerve resections, and plastic operations. The following chapter is given to special parts of the face; and in this are treated the surgery of the nose and neighboring cavities, the mouth, the jaws, the palate, the tonsils and pharynx, the tongue, the salivary glands, and the ears. The same systematic arrangement is pursued in the chapter on the neck. This includes the congenital defects, injuries, inflammations, tumors, diseases of the thyroid, pharynx, œsophagus, larynx and trachea.

All of these subjects are fully discussed. Not only is the grosser part of surgery dealt with, but questions of histological importance are also treated. Each chapter is complete in itself. Because of this fact there is much repetition. The author advises in each particular case that the wound be treated aseptically. In speaking of carcinoma of any particular organ, he is apt to observe that carcinoma of this organ is a disease met with especially in advanced life. This feature which makes each chapter a complete essay is certainly not out of keeping with a work of this broad scope. To make the subject complete even the most trifling details are given; and the German tendency to state self-evident facts is exemplified in a high degree.

The chapter on plastic operations on the face, that on epithelioma of the tongue, and the one on diseases of the thyroid are especially good.

Professor Koenig is a warm advocate of the use of iodoform gauze. He regards it as a great help in the achievements of modern surgery. The use of the iodoform gauze tampon, he believes, has diminished very greatly the danger of the operation for removal of the superior maxillary bone.

The section on laryngoscopy was written by Dr. Bose.

Statistics on the operative treatment of diphtheritic stenosis he is not inclined to regard of any great value, for the reason that the epidemics and the severity of individual cases is so variable. He cites as examples the statistics of Gosselin and others, who, out of ninety-five cases operated upon, lost every case; whereas in a single year in which he operated upon twelve cases, seven recovered.

Considerable attention is given to the operation of intubation, invented, he states, by Bouchut, and thirty years later revived in America, and employed also by a number of German surgeons. The results of intubation, he goes on to say, were soon reported as being better than tracheotomy, and this was no doubt true in America, where the results of tracheotomy were not so good as in Germany.

Professor Koenig is loyal to his German prejudices. He is not familiar with the English language, as are most of his colleagues; and his works, though rich in German references, refer but sparingly

to the literature of the western world. This is not because of his Hessian nativity, but because he regards German surgery as pre-eminently the most advanced. There are also an abundance of references of historic interest; and Hippocrates, and Celsus, and others, who are figuring less and less in medical literature, are encountered throughout the work.

The illustrations are good; that is, they clearly illustrate the particular point for which they are intended. Especially worthy of note are a set of cuts in the chapter on plastic operations, which illustrate the various incisions and sutures for repairing superficial defects. The general text is in clear, large print; and the less important matter, clinical observations, theories, and qualifications are in smaller type. The author writes in precisely the same verbose style as that in which he lectures in his clinic.

As an example of the sort of detail that is not introduced in American text-books on surgery, the following, from the chapter on tracheotomy, may be quoted, literally translated: "As it often happens that one has to operate at night, it is to be recommended, especially out in the country, that material for supplying a light be added to the tracheotomy outfit. For this purpose the wax candle is eminently sufficient. From five or six wax candles tied together with a string a very bright illumination can be made; and two of these bunches are sufficient to illuminate the field of operation. Of course, instead of these wax torches, candles, gas, or lamp-light can be used. Finally, it is self-evident that operations at night, even when by the best of light, are considerably more difficult than those which are performed in the daytime." It is true that the country about Göttingen is rather primitive, yet not so primitive but that in the poorest *bauerhaus* an oil lamp can usually be found, and always candles.

Notwithstanding certain superfluities this work is one of the best of surgical text-books. The large amount of information which it contains, the keen surgical judgment displayed by its author, the clinical examples cited, the completeness in every detail, make it a very valuable addition to the surgeon's library.

JAMES P. WARBASSE.

STUDIEN ÜBER DIE SPEZIFICITÄT, DEN ALTRUISMUS UND DIE ANAPLASIE DER ZELLEN; MIT BESONDERER BERÜCKSICHTIGUNG DER GESCHWÜLSTE. Von Dr. DAVID HANSEMANN, Assistenten am pathologischen Institut und Privatdocenten an der Universität zu Berlin. Mit 13 Tafeln und 2 Figuren im Text. Berlin, 1893: Verlag von August Hirschwald. (Studies of the Specificity, Differentiation and Deviation of Cells, with special reference to Tumors.)

In this magnificent study of the cell itself, Hansemann has contributed to scientific literature a work which every student of histology can well afford to peruse. As a result of a series of observations he has been able to confirm certain already accepted theories, to modify others, and, finally, to establish some new facts.

He expresses regret in his prefatory remarks that he should differ from his master, Virchow, on certain questions concerning the specificity of cells; and by way of apology quotes from the founder of cellular pathology: "Ich erkenna gern an, dass in manchen Richtungen, zum Beispiel in der Kenntniss der karyokinetischen Vorgänge, so [grosse Fortschritte gemacht sind, dass dadurch ganz neue Gesichtspunkte gewonnen wurde."

In the first chapter he takes up the subject of the specific character of cells. He discusses the question of cellular metaplasia, and presents the two opposed theories as to whether a given kind of cell becomes changed into a different kind, or whether a cell becoming associated with different conditions becomes itself changed by accommodation. In this line is also brought up the question as to whether a connective tissue cell can become converted into an epithelial cell, according to Virchow, or whether the epithelial cells are transformed into connective-tissue cells, as Recklinghausen claims.

The author has devoted much time and patience to the study of the nuclear mitoses. The methods of fixing and studying the karyokinetic figures are given, and the question of histological accommodation is fully discussed. He observes that during the process of



division the cell assumes more the character of the kind and represents less the individual. This he attributes to the fact that during division every other function of the cell is in abeyance. It neither assimilates nor secretes. The observations of Martinotti would tend to confirm this view, for he found that certain colored salts, as sodium indigo-sulphonate, when injected among kidney cells, were readily taken up by the passive cells, whereas those in the process of division refused to absorb the salt.

Hansemann also points out the peculiar and characteristic process by which the various cell varieties divide. He has observed that in the processes of regeneration, of hyperplasy and inflammation each cell retains its peculiar type of division phenomena. These specific properties are so constant that in every variety of tissue are peculiar features in the karyokinetic figures which make possible a differentiation of tissues based solely upon the form of the mitoses.

The nuclear changes in cell division are thoroughly discussed. A section is devoted to the duration of the time required for division of the various kinds of cells. And, as a conclusion, he is able to confirm by observation what Bard first offered upon theoretical grounds: *Omnis cellula e cellula ejusdem generis*.

He rejects entirely the doctrine that epithelium can develop from connective tissue or that connective tissue can develop from epithelium. That ciliated epithelium can become converted into flat epithelium; or that in cysts of the spermatic tubules of the testicle the epithelium may be converted into squamous epithelium, is well known, and designated as histological accommodation. It would, however, he claims, be incorrect to regard such cells as belonging to the epidermis variety. It is true that connective tissue can form bone or fat tissue, but Hansemann believes with Ziegler that not every connective tissue can form bone or fat, but that these are properties of special varieties of connective tissue. For example he shows that the myxoid tissue of the foetus becomes changed into fatty tissue, excepting the myxoid tissue of the eyeball—demonstrating that there are at least two varieties of this tissue. He calls attention to the great differ-

ence in connective tissue in different parts of the body: that of the skin and ovary, for example; in which, too, the mitoses show a very great difference. He is even inclined to regard the connective tissue of each organ as specific, especially on the ground of the form of the mitoses.

In view of such a specificity of cells it becomes necessary to consider how these many varieties of tissue come about from a single cell. The author takes up these questions and discusses them from the standpoint of histological accommodation, and from the view of inherent vital differentiation of cells. Here he lays great stress upon a symmetrical mitosis, and shows that in the process of cell differentiation a new variety of cell originates by an unequal division of a parent cell; and that, as this offspring continues to divide equally, it produces an organ or a peculiar group of cells. This principle of asymmetrical division is based upon the theory that each cell contains a variety of plasmata, and that any division resulting in two cells in which the constituent plasmata are equally divided, propagates the parent type; but when an unequal division of these constituents occurs, a new variety of cell is the result.

In the chapter on the altruism of cells he evolves this beautiful doctrine of the plasmata. The original ovum cell contains these different kinds of plasmata in a definite proportion, each having its definite function. When an unequal division occurs, each cell has its complement or antagonistic cell which later represents a particular tissue or organ. As an evidence of this altruism in the fully developed body, the author shows that no organ, the function of which is known or unknown, can be destroyed without causing disturbance among its antagonistic or complementary cells.

After considering the "Altruismus der Zellen" in the light of actual observation, the author in closing states that his observations only tend to confirm the doctrine which Darwin has already founded in his hypothesis of pangenesis.

The final chapter of the work is devoted to the anaplasia of cells, and deals largely with the question of tumors. This chapter is finely

illustrated with micro-photographs. A number of these photographs show the bodies which some observers have regarded as parasites. They are, according to Hansemann, undoubtedly parts of mycotic nuclei, and are found in cells in process of division. The doctrine of Adamkiewicz, that all carcinoma cells are parasites, he regards simply as a "curiosum."

He designates as anaplasia any deviation from regular heredity, and makes it dependent, therefore, upon the asymmetrical division of cells with reference to their various constituent plasmata. By virtue of the anaplasia of cells, new organs are formed; and the development of tumors is dependent upon this same principle.

The whole work shows careful and painstaking research in the field of normal and pathological histology. We need in surgery more investigation of just this sort to make clear the nature of certain diseases, our knowledge of the pathology of which has been grounded in vague and unsubstantiated theories.

JAMES P. WARBASE.

THE THEORY AND PRACTICE OF MEDICINE. Prepared for Students and Practitioners. By JAMES T. WHITTAKER, M.D., LL.D. With a chromo-lithographic plate and 300 engravings. New York: William Wood & Co., 1893.

But a few years ago works on the theory and practice of medicine were devoted largely to symptomatology and therapy. The modern tendency is to lay especial stress upon the pathology of diseases. With this as a rational basis the treatment can be better worked out. And as our knowledge of pathological conditions accumulates, empiricism in therapeutics becomes obsolete.

In the preface of this work which now lies before us, the author states that in the preparation of the book the most work has been put upon the infections as the most frequent and dangerous, at the same time the most preventable, of all diseases; and in the study of the infections the most space has been devoted to cause and diagnosis, for the reason that a knowledge of the cause establishes pre-

vention, and with the diagnosis develops treatment, except in so far as treatment must still remain wholly symptomatic. The author voices the most advanced sentiment, when he says that from this standpoint this book is prepared for the student and practitioner of medicine, but especially for the young physician who, with microscope and test-tube, would fit himself for the higher places in his profession.

The work is divided into two parts: the first, devoted to general diseases, and the second, to diseases of organs. Part I, dealing with infections and parasites, contains chapters on ectozoa, entozoa, bacteria, and infectious diseases. Part II takes up in turn diseases of the organs of digestion, respiration, circulation, genito-urinary system, and nervous system. The general plan is to give under each disease synonyms, definition, history, pathology, symptoms, complications, diagnosis, differential diagnosis, prophylaxis, and treatment.

There seems to be a great lack of uniformity in giving the synonyms, for, whereas some diseases are given in half a dozen different languages, others are given in only one or two. So we find the names of diseases given in English, Greek, Latin, French, German, Italian, Swedish, Dutch, Danish, Scotch, and Sanskrit, one or more, "without regard to license or law." "Nervenfeber," a word but little used by the Germans, is given as the German for typhoid. The histories of the various diseases are brief, but very interesting; and, of course, the ubiquitous Hippocrates is frequently encountered.

The pathology of the parasitic diseases is an admirable feature of the work. Bacteria are described accurately and comprehensibly. Their biology, and the methods of cultivating, staining and identification are given.

Carcinoma of the stomach he speaks of as "an epithelial overgrowth, probably caused by protozoa." In speaking of what among pathologists is recognized as a frequent source of carcinoma of the stomach, he says, that "cancer develops occasionally, but only exceptionally, in the borders of an ulcer, probably, however, only a mere coincidence." The picture of scirrhous carcinoma, in the chapter on

carcinoma of the stomach, is not necessarily a carcinoma of the stomach, as it shows nothing peculiar to carcinoma of the digestive tract, and might be a scirrhus of any other organ.

Cancer of the liver, he makes the great mistake in saying, is primary in 18 per cent. of cases.

Contrary to the generally accepted view he speaks of Addison's disease as an affection of the supra-renal capsules.

Cerebral thrombosis and embolism are included under the head of apoplexy, and are given no consideration whatever. Diagnosis and differential diagnosis are well set forth; and many chemical tests are given as diagnostic aids.

Symptoms of diseases are for the most part briefly and well described. The text is not burdened with rare and non-characteristic symptoms.

The therapeutic considerations show the work of a practical man. The author has not introduced all of the known remedies recommended by known and unknown writers, but speaks briefly and of the drugs which have met with modern approval. Among these the coal tar products play a prominent part.

In the treatment of syphilis, the practice of the Vienna school is recommended; inunction of mercurial ointment; and calomel for internal administration. He does not recommend the excision of primary chancre.

The chapter on hysteria is worthy of note.

The author is quite out of touch with modern surgery in the eleven and a half pages devoted to typhlitis, perityphlitis, paratyphlitis, and appendicitis.

The old authorities quoted, and the general antiquity of the ideas make this section of the work quite out of keeping with the very advanced and modern sections treating of the other parasitic diseases. This chapter can best be disposed of by saying that modern surgery condemns the whole thing, from the confusing and incomplete pathological anatomy to the homicidal treatment. Only when a distinct doughy sensation, or a more marked fluctuation indicates

the development of pus, does he recommend that steps be taken to secure its evacuation. Opium is recommended as the treatment par excellence. Just what it will do for the necrotic appendix about to rupture, or the deeply-seated suppuration which gives no fluctuating tumor, he does not state. Opium, the author states, is not contra-indicated in appendicitis, even though the element of faecal impaction be superadded.

So long as medical teachers inculcate such doctrines as this, just so long shall we continue to see the deplorable and extreme cases of appendicitis sent to our hospitals for the final surgical unction. Dr. Whittaker has either observed but few cases of appendicitis, has confined himself to the ancient literature of the subject, or has seen some bad surgery, to have got his mind into the state for writing this chapter.

About the same comments apply to the chapter on intestinal occlusion. It is full of errors.

Gall-stones, he states, constitute the most frequent cause of intestinal occlusion. "The classical treatment of occlusion is the administration of opium in doses which put the bowel at rest," and he might have added the patient also.

Opium is recommended in the treatment of peritonitis.

We cannot agree with the author that, "the most frequent, severe and dangerous disease connected with the liver is that produced by the formation and discharge of gall-stones." The surgical treatment of cholelithiasis is not even hinted at. The treatment rests on the treatment of the colic, and on prophylaxis. "The best treatment of gall-stones consists in the administration of Carlsbad salts," he says, with salicylates and certain hygienic measures.

No surgical treatment is mentioned for nephrolithiasis.

The chapter on abscess of the liver, though brief, is sound.

The remarks on the treatment of carcinoma of the stomach are unsatisfactory. The use of the knife he regards as a "confession of despair."

Were it not for these surgical blunders, the work would have



everything to recommend it. The style is clear and concise ; the printing and illustrations are good ; the amount of practical and valuable scientific information is greater than in many larger works on the same subject ; the infectious diseases are admirably handled. The student with a proper surgical training will find this work a valuable addition to his library.

Dr. Whittaker has appropriately dedicated it to his former teacher, Dr. Robert Koch, and to his friend, Dr. George M. Sternberg.

JAMES P. WARBASSE.

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# ANNALS OF SURGERY

A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE

EDITED BY

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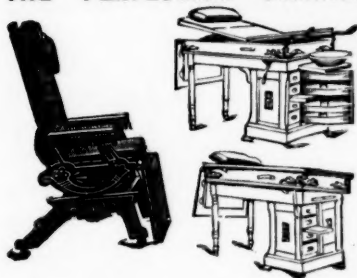


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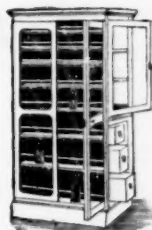
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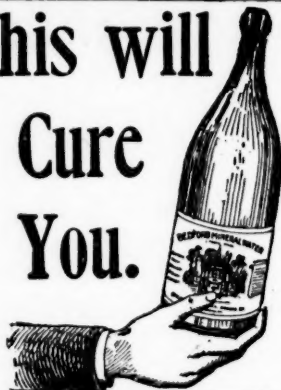
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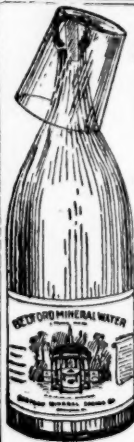


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About a year since the *Journal of the American Medical Association*, in an editorial article, referred in unqualified language to the strained relations which it asserted were existing between physician and druggist; the salient cause being the habit of counter prescribing, coupled with the more vicious habit of substituting. Since then, if we may judge from the tone of the bulk of new literature being sent out, the substitution habit is shown to be the one great enemy overtopping all others, to successful medical practice.

We do not mean to assert that all pharmacists are given to the habit. On the contrary we believe a large majority of them to be entirely free from and above suspicion. Still the fact remains that substitution is practiced to such an extent as to engender anxiety and timidity on the part of prescribing physicians.

Persistent effort at substitution is but a commendation of the genuine product sought to be imitated, and the practicing physician is quick to recognize the fact. And, once recognizing it, his confidence in the genuine is strengthened, while at the same time he is forced into the unpleasant attitude of maintaining a constant wariness over his prescriptions.

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